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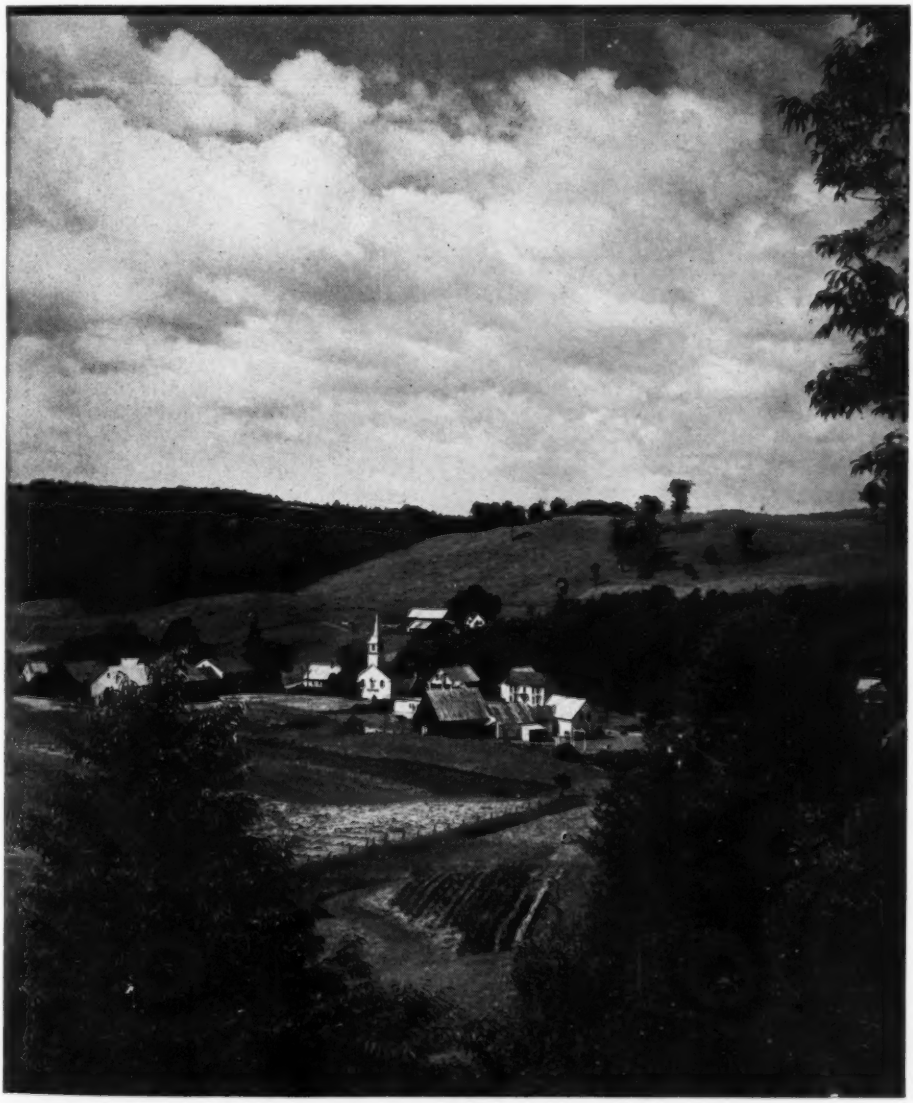

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# Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

*Editorial Office:* 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIV NO. 8

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**Something to Smile About**

Better Crops with PLANT FOOD

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VOL. XXXIV WASHINGTON, D. C., OCTOBER 1950 No. 8

***In Consideration of . . .***

# Fall Maneuvers

Jeff McDermid

AGRICULTURAL fall maneuvers find our foresighted farmers plowing under bad insects, spraying waste borders where pestiferous varmints lurk, mending fallen fences and farm machinery, disinfecting grain storages, and finally, reseeding well-tilled land to restorative and protective crops, always mindful of the next year's harvest. Such preparedness is an old story. Followers of the ancient food and fiber craft have always lived and planned and delved and denied themselves in a twilight zone betwixt two different worlds—one of rural serenity and apparent peaceful calm and snug content, and the other one of constant watchfulness and bitter warfare, of attack and defense against hordes of natural enemies. Farmers have always known that success and achievement are purchased with terrific pressure and eternal vigilance—like democratic freedom and liberty itself.

Of late all citizens of this good country have been living like embattled farmers—between two fronts, living strangely double lives made up of our own humdrum duties and responsibilities on the one side, and the tension and the foreboding set forth in daily headlines and alerting radio broadcasts on the other. Like the farmers, too, we are getting a late start toward the necessary and advisable fall maneuvers which prudence and a common welfare dictate. This is all very disquieting and disrupting to our brave hopes for

our children and our overmastering habit of good will to mankind. It's pretty galling and embarrassing to be lied about and misunderstood, yet we have faith enough and unity enough to make flags and ring church bells on October 24 in recognition that we do not stand alone in the program for peace.

Nevertheless this era of national vigilance may have its value, to bring us back along the trail of our history to remember times when our own founders of liberty fought against inertia and greed in the colonies while trying to put forth a strong front to a distant power that was crushing freedom and representative government. Maybe some of us have forgotten the lessons of those colonial struggles, when so few faced so many and leaders were divided as to the right course of action.

AS the first Continental Congress met at Philadelphia the patriots communicated often by means of Committees of Correspondence and County Resolves. Paul Revere rode down to the Congress carrying in his big coat pocket the attested copy of the Suffolk county resolves, written in Boston by a besieged group of citizens. To quote a few sentences from this document brings one into close harmony with the times and shows us how much alike were their dilemma and ours today.

"Our enemies have flattered themselves that they shall make an easy prey of this numerous, brave and hardy people, from the belief that they are unacquainted with military discipline. . . . On the fortitude, the wisdom and the exertions of this important day is suspended the fate of this new world, and of unborn millions. To us our venerable progenitors bequeathed the dear-bought inheritance of liberty, to our care and protection they consigned it; and the most sacred obligations are upon us to transmit the glorious purchase, unfettered by power, unclogged with shackles, to our innocent and beloved offspring.

"We recommend that by a steady, manly and persevering opposition we shall convince our enemies that in a cause so solemn our conduct shall be such as to merit the approbation of the wise, and the admiration of the brave and free of every age and of every country."

I doubt if in all our history you will find a better statement to use alongside the pronouncements of valor and resolve which animate the sentiments of the citizens of our nation in 1950.

Meanwhile there are folks who spend too much time and effort pointing to the laxity of our people and the quick demobilization from war to peace in 1945. There may be some grain of truth behind it, but on the whole that period of five years has not been spent in vain; and we have testified our peaceful intent by mobilizing for helpful production rather than for selfish conquest or imperial designs. Mistakes have been made, but largely ones of the head rather than of the heart. From this time onward we fervently hope that it will be a different story. We may have been "suckers" sometimes, but never "sneakers." From this time onward let's hope we shall be neither.

Our major efforts, as one youth leader of rural America says, "have been spent in endeavoring to promote a peaceful world settlement of differences; in producing new and useful goods in greater quantities than ever before thought possible; in providing considerably increased educational opportunities for the youth of this and other lands; in bringing a sense of greater security to the average workingman; in making extraordinary strides in scientific fields to ease pain and to prolong life; in assuming leadership in restoring the suffering peoples of the world, as well as in strengthening our national defense facilities."

"Whom the Lord loveth, He chasteneth." Adversity often makes a people stronger. If we stand firmly by our over-riding principles to spread the good things of life to less fortunate people, it is possible that our goal may

be part of a Divine plan—the achievement of which will be much greater and nobler than the establishment of liberty here in the first place.

BUT in all this dedicated purpose we must not forget that we cannot do all these fine things alone by ourselves. Without the "decent opinions of mankind" supporting the program through United Nations and

similar hopeful movements, one lone country with a small portion of the world's population and rapidly diminishing resources cannot be a Savior and a Santa Claus combined. We are not in this joust to show off, like Don Quixote.

Let's remember there are several other nations with ideals as high and as noble as ours—even though a few of them do not have governments quite like ours. Many of them are small nations, mere spots on the world map, but each one is a maker of opinion and a partner in the future. To such brave and devoted nations defeat is unthinkable and surrender but temporary, at the worst.

When a writer accustomed to the everyday flow and placid stream of the seasons attempts to set down some thoughts for perusal a month ahead in these critical hours of swift change and sudden tragedy, his task is not a simple one. What is a fact today may be a fact tomorrow, but other new facts and forces eclipse the former ones and alter the action deemed best fitted to the hour. I recall how the former Arizona Senator Ashurst used to say in oratorical periods, "A strong man is never consistent. I do not treasure the jewel of consistency."

I like to recall the words of Rev. Peter Marshall, once pastor of a church in Washington, D. C., and for a time chaplain of the Senate. He was a poor, friendless immigrant from Scotland in the first place, but his power and poetry took him into high places before his early death three years ago. He was an ardent patriot of American ideals and repeatedly said that this country gave him a helping hand when he was lonely and bereft. Listen to this little creed of his in prayer:

> "Our Father, when we long for life without trials and work, without difficulties, remind us that oaks grow strong in contrary winds and diamonds are made under pressure.
>
> "With stout hearts may we see in every calamity an opportunity, and not give way to the pessimism that sees in every opportunity a calamity."

Like Edwin Markham, Rev. Marshall also believed that "Defeat may serve as well as victory to shake the soul and let the glory out."

Winston Churchill stated in his memoirs that right after Dunkirk was the time of Britain's finest hour. Likewise, Valley Forge and Pearl Harbor were symbolic of the turning point of hope and valor.

In these wonderful autumn days when you ride out across the fields and witness the glory of the tree and landscape color, you take in the peaceful villages and the happy homesteads, each busy making all shipshape and snug for the coming winter. In none of their hearts lurk the seeds of suspicion or fear or the blight of ruthless government. They are free men able to go their ways in peace and cooperation. We who have lived most of our lives with these country-minded, honest, and courageous folks are aware as few others are of their grit and valor when aroused in defense of liberty and decency.

(*Turn to page* 49)

# Planned Forage Production and Fertilization Pay

*By Lester H. Binnie*

Soil Conservation Service, Vincennes, Indiana

A WELL-planned pasture program has helped level the hills and valleys of milk production on the Anton Bittner farm near Evansville, Indiana. Only a few years ago he found it impossible to maintain uniform production during the late summer months. Many other producers in the Evansville milkshed had the same problem. Recognizing that each might have a part in solving this problem, representatives of the Soil Conservation Service, Extension Service, and the Milk Producers Association met to consider a logical solution.

Most dairymen were depending on bluegrass and annual lespedeza for their pasture program. This program left big gaps in the supply of succulent forage in both early spring and late summer. Prolonged barn feeding was costly and inefficient. Mr. Bittner readily agreed to try another system. He now turns his herd out of the barn early and gets nearly a month's grazing from Balbo rye.

In 1949, eleven acres of rye supplied three weeks of early spring grazing for his herd of 27 Holstein cows. As soon as the Balbo rye began to fail he turned the cows into a permanent pasture of Kentucky bluegrass-birdsfoot trefoil-ladino mixture. This was followed by second growth alfalfa-brome combination from which a hay crop had been harvested. Alternate mid-summer grazing between the alfalfa-brome combination and the birdsfoot trefoil permanent pasture was supplemented with ladino-grass night pasture near the farm buildings.

The wide fluctuation in milk production from a low in late fall to a high in May has bothered Evansville milkshed producers and distributors alike, according to Byron A. Field, manager of the Evansville Milk Producers Association. Fluid milk consumption drops off in May at the peak of production, perhaps because of garlic or other objectionable flavors. Consumption picks up again in September just after production begins a steep decline to reach the bottom in November.

From the standpoint of the producer, a uniform supply of high quality milk 12 months out of the year has value in a price-bargaining program. Excessive production of milk in spring and summer over the market requirements must be sold in the surplus classification and causes the blend price to be reduced quite rapidly.

Low production in the fall and winter on the part of average producers causes the market to carry more shippers in order to meet the market requirements at this season. This increased number causes huge surpluses in May and June to further depress the blend price, according to Mr. Field.

The accompanying graph shows a comparison between the production of the average milk producer in the milkshed and the production on the Bittner farm when May production represents 100 per cent. It is based on the years 1948 and 1949. While the average producer reaches the low point in November, Mr. Bittner's herd reaches a low in January. This low point is 8 per cent higher than the low for the average producer. Even more significant is the 24 per cent higher production from the Bittner herd in November as compared to the average producer.

**Fig. 1. An area on Mr. Bittner's farm after he started working with his farm plan. Part of the Bittner herd is shown grazing on an alfalfa-brome mixture in 1945.**

While production from the Bittner herd is fairly constant during the last seven months of the year, it does tend to increase slightly from July through October at the time when average producers are in a rather severe decline. This decline on the part of the average producers has been attributed to the use of annual lespedeza which seems to be much better for producing fat on beef animals and sheep than for producing milk from dairy animals.

The relatively low production of the Bittner herd during January, February, and March can be attributed to at least two causes. First is the lack of silage for winter feeding. At present the herd receives good quality legume hay and 3½ pounds of grain mixture two times a day during the winter season.

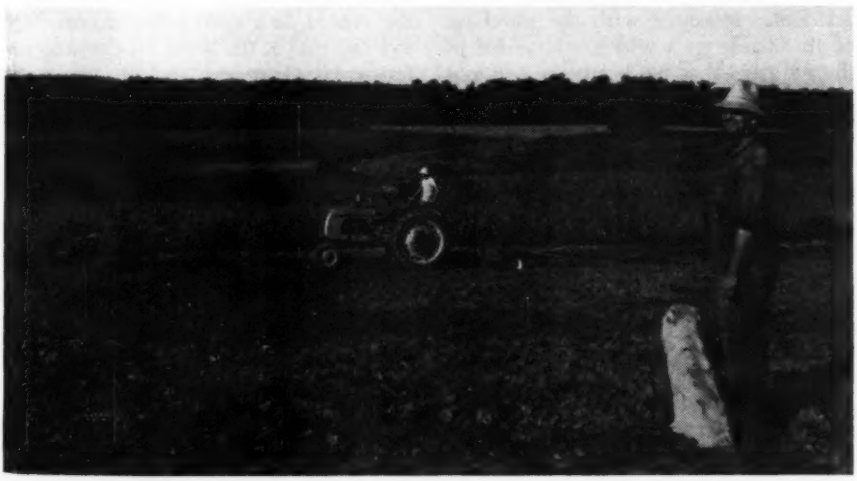

**Fig. 2. The same area as shown in Fig. 1 in the fall of 1949 when being prepared for a new seeding using the trash-mulch system. Five hundred lbs. of 0-15-15 fertilizer were supplied at seeding time.**

The grain mixture consists of 1,500 pounds of corn, 400 pounds of bran, and 100 pounds of soybean oil meal. The second factor has been the difficulty of arranging the breeding program so that cows freshen in the fall. While this aim is always kept in mind it has been difficult to achieve.

Bittner says the pasture and roughage program has been a distinct advantage to him in several ways. Besides supplying an abundance of high quality feed it has enabled him to make the best use of land not well suited to regular rotation crops. The land now in bluegrass-birdsfoot trefoil-ladino clover mixture was steep and rather severely eroded, as is the land now in alfalfa-brome combination.

These forage crops can make good use of phosphorus and potash in spite of low humus supplies and can produce high yields of quality feed when compared to the production of corn or wheat on the same land. Soil is protected from washing and the lime and fertilizer applied stay at home. For his program, Mr. Bittner thinks that potash is perhaps the most important plant food needed. He uses fertilizer containing equal amounts of potash and phosphate and returns all residues and manure to the land.

Mr. Bittner's pasture program is no accident. It began with the purchase of an 88-acre tract which was added to the 88 acres that made up the original farm. The new purchase included land which he knew was subject to severe erosion, and so he requested help from the Southwestern-Indiana Soil Conservation District. In working out his farm conservation plan he received help from the U. S. Soil Conservation Servive technician loaned to the District. The Extension Service helped in planning his pasture program. His farm was one of several selected in this and neighboring counties upon which the latest findings in improved forage production were tried and demonstrated.

Mr. Bittner's plan is based upon an inventory or careful survey of his soil. It combines the various practices necessary to conserve his soil and moisture resources and at the same time provide the kind and amount of forage required for uniform dairy production.

He says some of the ideas, particularly those of giving up corn on the steeper land, moving fences to have fields fit good land-use, the use of diversion terraces, and a trash-mulch seedbed for alfalfa-brome combinations seemed a little strange in the beginning. Now that he has been operating according to this modified grassland system he and his family are enthusiastic about its possibilities. He believes that if applied to other farms of average producers this kind of conservation farming would do a good job of controlling soil loss and at the same time would increase farm income.

COMPARISON OF MONTHLY MILK PRODUCTION

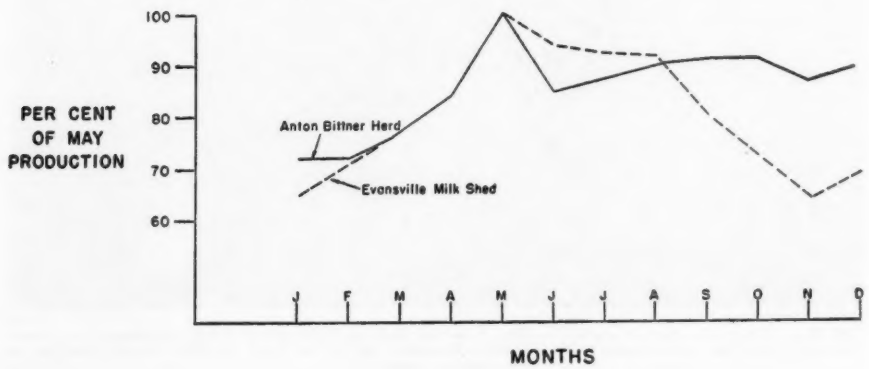

**Fig. 1. Where cornstalks had been removed, the soil lost 1.95 inches of runoff and 10.14 tons of soil per acre. The bare land lost nearly 4 times as much water and 19 times as much soil as that with a mulch of cornstalks.**

# Keep Crop Residues on Surface of Ground

*By J. H. Stallings*

Research Specialist, Soil Conservation Service, USDA, Washington, D. C.

RESEARCH data show that any form of crop residue is more effective in reducing runoff and soil loss by erosion when kept on the surface of the ground than when turned under. The data also indicate that leaving the crop residue on the surface is a more effective way of building up the organic-matter content, of improving the aggregation, and of maintaining a high infiltration rate of the soil than turning it under. In many cases residue on the ground surface is equally satisfactory in maintaining a high level of crop production.

Vegetal covers, whether living or dead, accomplish these objectives. Likewise, residue material, whether left on the surface or turned under, is superior to no crop residue. The use of crop residue on the surface offers a satisfactory means of supporting those places in crop rotations where the rotation crops themselves do not provide adequate protection for the soil against the action of the raindrop during hazardous periods of high impact storms. The vegetal cover absorbs the energy of the falling raindrops and prevents the destructive action of their beating on bare land.

Duley and Russell found that where water was applied artificially to 0.005-acre plots at the rate of about 1.5 inches per hour to simulate rainfall, wheat straw stubble left on the surface almost completely eliminated erosion and reduced runoff about 95 per cent over that of a bare cultivated Marshall silt

loam with a 4 per cent slope. Out of a total of 15.33 inches of water applied to the bare cultivated soil 6.27 inches entered the ground and the other 9.06 inches ran off taking 3.44 tons of soil per acre with it. At the same time 15.54 inches, out of 15.96 applied to a similar soil covered with combine wheat stubble, entered the ground leaving only 0.42 inch to run off, which carried 0.03 ton of soil with it.

The foregoing results compared favorably with results obtained under field conditions during the fallowing seasons of 1939-41, inclusive. The average annual rainfall for the three fallow seasons, which included the periods of April-September, was 12.43 inches. The average annual runoff for the period was 1.97 inches for a disked plot which received no organic matter, 1.39 inches for a similar plot receiving two tons of wheat straw disked in, and 0.60 inch for a plot receiving two tons of wheat straw and subtilled. The soil losses per acre were 13.04 tons for the disked plot, 6.24 for the straw disked in, and 0.97 ton for the plot subtilled.

During this period the plot with the straw disked in lost more than twice as much water by runoff and six times as much soil as where the straw was on the surface. Bare disked land lost three times as much water and 13 times as much soil as an adjoining stubble plot with residues on the surface.

### After Cultivation

Woodburn found that two tons of straw, applied as a mulch after the land had first been cultivated, reduced erosion to 0.1 ton per acre and the runoff to six per cent. During the same period a bare soil lost 21 tons of soil and 44 per cent of the rainfall as runoff. The experiment was conducted on Houston clay. The time extended from July 1 to December 31, 1942, during which a total of 14.83 inches of rain fell.

Peele found that oat hay and crimson clover used at the rate of 2.5 tons per acre as mulching material reduced runoff and soil loss on four different soil types during the period of June 16 to November 23, 1944. The average runoff for the four soil types was 18.04 per cent for bare land, 1.25 for oat hay mulch, and 0.33 for crimson clover mulch. The soil loss was 2,428 pounds per acre for the bare land, 61 for the oat hay mulch, and 20 for the crimson clover mulch. An average of 14.5 inches of rain fell during the period.

The use of five tons per acre of crimson clover and Kobe lespedeza as a mulch on Cecil clay reduced runoff from 48.4 per cent of the total rainfall of 94.43 inches to 3.5 per cent, and the soil loss from 178,300 pounds per acre for an unmulched plot to 1,500 pounds per acre for the mulched plot. The period covered was August 1939 to January 1942.

Hendrickson, Carreker, and Adams report soil loss of 12.57 tons per acre and runoff 32.74 per cent of a total rainfall of 25.27 inches for unmulched soil for the period of April to September 1940, compared with corresponding losses of two tons of soil and 1.43 per cent of rainfall as runoff for soil mulched with three to four tons straw per acre.

### Primary Effect

The primary effect of vegetal cover in reducing runoff and soil loss was generally conceded to be due to the impediment it offered to overland flow until Borst and Woodburn showed it to be due to the de-energizing of the rain drop instead. They applied artificial rain to three series of plots at the rate of approximately 2.25 inches per hour. The plots were left bare and exposed to the action of natural rains for some weeks. During this period the surface soil became crusted or "sealed." Two of these series of plots were then covered with straw at the rate of two tons per acre. In one series, the straw was placed directly on the ground and in the other it was supported one inch above the surface of the ground on chicken wire. The third series was left bare. Artificial rain was then applied

at the above rate. It was found that 92.7 per cent of the water applied ran off the bare plot compared with 65.0 per cent for the plot with the mulch placed directly on the soil and 83.2 per cent for the plot where the mulch was supported one inch above the ground. The corresponding soil losses for the three plots were 5.62 tons per acre for the bare, 0.42 ton for the first mulched plot, and 0.26 ton for the mulched plot where the straw was supported one inch above the ground.

These figures show that the mulch was not very effective in controlling runoff when applied after the surface of the soil had become sealed, but did materially reduce the rate of soil loss. Had surface flow been the chief factor in bringing about erosion, the rate of soil loss should have been much higher on the plots where the mulch was supported one inch above ground than on the plot where the mulch was placed directly in contact with the soil.

### Manure Topdressing

Further light was shed on this point by use of two additional series of plots on which the surface of the soil was broken to a depth of about one inch and straw mulch applied at the rate of two tons per acre. In one series the mulch was placed directly on the surface of the ground and in the other it was supported one inch above the surface on chicken wire. Water was applied at the usual rate of 2.25 inches per hour.

The mulch in this instance almost completely eliminated both runoff and erosion. The plot with the mulch resting directly on the surface of the ground lost 1.7 per cent of the water applied as runoff and 0.10 ton of soil per acre. The other plot lost 1.2 per cent of the water applied as runoff and 0.12 ton of soil.

These studies show that the chief function of the straw was energy absorption or protection from raindrop impact and not the impediment of overland flow.

Lamb found that 10 tons of manure used as a topdressing after planting consistently saved much more soil and water than did 20 tons plowed under during the period 1943-48, inclusive, and produced as satisfactory crop yields. At the end of the sixth year of the experiment the level of organic matter of the soil appeared to be more closely related to the method of application and the amount of erosion that occurred than to the amount of manure applied.

### Effect on Yields

Lamb, Andrews, and Gustafson reduced the loss of water to less than one-half and the loss of soil to less than one-fourth by leaving 750 pounds of buckwheat straw per acre on the surface as a mulch. Records for two years show that plots with residues plowed under lost an average of 2.4 inches of water and 2.2 tons of soil an acre for the period June 10 to December 1 of each year 1942 and 1943.

Six tons of straw mulch per acre on Groton soil with a slope of 35 to 45 per cent reduced runoff on the average from 1.93 inches for fallow to 0.16 inch and soil loss from 9,132 pounds per acre to only a trace during the period May through October during each of the three years, 1940-42. Soil mulched with an average of 12 tons of straw per acre per season for 1939-40 produced an average acre yield of 7,125 pounds of grapes compared with 5,325 pounds for a similar area clean cultivated. In 1941 there was little difference in yield, and some evidence of late growth and winter injury caused by an over-supply of nitrogen was noted.

Van Doren and Stauffer found that soil losses ranged from 14 to 149 times greater from unmulched plots than from plots protected by straw mulch. Wheat straw, corn stover, and soybean residue were the materials used. Alderfer and Merkle found that mulches composed of manure, straw, sawdust, corn stover, oak leaves, and pine needles completely eliminated runoff on Hagerstown silt loam where water was

applied at the rate of 1.5 inches per hour. Three and four years of mulching with these materials resulted in complete control of surface runoff and effected an infiltration capacity equal to, or in excess of, three inches per hour.

In addition to controlling runoff and erosion more effectively when left on the surface than when turned under, crop residue on the surface builds up the organic-matter content of the soil at a faster rate than when turned under. Moser found that by turning under four tons of crimson clover per acre the organic-matter content of the soil was increased from 1.75 per cent, where no residue was applied, to 2.52 where the crimson clover was turned under. When applied to the surface as a mulch the organic-matter content of the soil increased to 2.54 per cent. Under similar conditions where lespedeza residue was allowed to accumulate to form a natural mulch the organic-matter content of the soil increased to 3.74 per cent.

Peele found that by using four tons of Kobe lespedeza hay per acre as a mulch the runoff was held to 3.4 per cent of a total rainfall of 94.43 inches during the period under study. The soil loss was 1,500 pounds per acre. An adjoining plot which had four tons of Kobe lespedeza hay turned under lost 42.7 per cent of the total rainfall as runoff and 107,700 pounds of soil per acre.

Alderfer and Merkle found important differences in the organic-matter content of the soil at three different depths at the end of the fourth year in favor of leaving crop residue on the surface rather than turning it under. The organic matter content was determined for 0-1 inch depth, 1-3 inch depth, and 3-6 inch depth in each case. The mulched plot had 3.72 per cent organic matter for the 0-1 inch depth compared with 2.71 per cent for the plot where the crop residue was turned under. Corresponding figures for the 1-3 inch depth were 3.11 per cent for the mulched plot and 2.89 for the plot where the residue was turned under, and 2.75 and 2.55 per cent, respectively, for the mulched and incorporated plots for the 3-6 inch depth. These figures are the averages for six different kinds of organic materials used.

Van Doren and Stauffer found that soil aggregation was very definitely favored by mulching with straw. Alderfer and Merkle found that the

**Fig. 2. Fall disking of wheat stubble in preparation for stubble-mulch fallow.**

**Fig. 3. View of cover left on erosion clover plot after planting the clover following a stalk cutter and one disking.**

average stability index of the soil was definitely higher in each depth, namely, 0-1 inch, 1-3 inches, and 3-6 inches where the crop residue remained on the surface than where turned under. The stability index for the 0-1 inch depth was 57.9 on the mulched plot compared with 54.2 on the plot where the residue was turned under. Corresponding figures for the 1-3 inch depth were 59.0 and 55.9, and for the 3-6 inch depth, 60.7 and 58.8.

Havis found that Wooster silt loam soil reached a relatively high state of aggregation under straw mulch such as that often applied around fruit trees. This condition is reached quickly if the mulch is of unleached wheat and alfalfa. Bluegrass sod treatment over a long period is of value in increasing and maintaining a high percentage of the aggregates of the larger size but is not as effective as mulch. Cultivation, even with such cover crops as can be produced in a mature apple orchard, is very destructive of soil aggregate structure. Mulch has a value in the formation of aggregates which is out of proportion to differences in organic matter present.

Kidder, Stauffer, and Van Doren found that total infiltration was greatly increased by the presence of wheat straw mulch on three different occasions. Tests were made in June 1941, October 1941, and again in April 1942 on soybean and corn land. The average total infiltration for the first 60 minutes for the three different dates and the two crops was .56 inch on the bare land and 1.67 on the mulched soil. Findings of other investigators verify these results.

Crop yields are also higher in some instances where residue material is left on the surface than where turned under. Hendrickson and Crawley obtained as high or higher yields of lespedeza hay during 1939 and 1940 from eroded abandoned land that had been mulched as from ordinary farm land in the vicinity which was cultivated the conventional way. A complete failure was experienced where lespedeza was planted on eroded abandoned land that was not mulched, however. These mulched eroded abandoned areas produced 282 pounds of lespedeza seed per acre in 1942. This equaled or exceeded the seed yields obtained on the best of

the cropland fields. Peele secured higher corn yields on four different soil types where mulches were used than where no mulching material was used. The average acre yield for the four soil types where no mulch was used was 17 bushels. Comparable plots mulched with oat hay produced 21.3 bushels and other plots mulched with crimson clover produced 28.4 bushels per acre. Copley, Britt, and Posey found that flue-cured tobacco produced greater yields when mulched than when not mulched, during years of normal or below normal rainfall. However, the yields on the mulched plots were lower than those of unmulched plots during seasons of excess rainfall. Duley and Russell report an average annual acre yield of 28.3 bushels of corn on unmulched land for the three-year period 1939-41, compared with a yield of 36.8 bushels for land mulched with two tons straw per acre. They also found that corn yields were higher on land where the straw was left on the surface than where it was turned under. Corn following small grain with the stubble plowed under produced 21 bushels per acre compared with a yield of 27.3 bushels per acre where the stubble was sub-tilled.

### Need for Fertilizer

Van Doren and Stauffer reported that the use of two tons of wheat straw per acre as mulch depressed corn yields, increased soybean yields slightly, and did not affect the yield of hay materially. Mulched corn land produced an average annual acre yield of 76.5 bushels of corn for the three-year period 1941-43 compared with a yield of 92.7 bushels for unmulched land. During the same period soybeans produced 31.5 bushels per acre on the mulched land and 29.2 bushels on the unmulched land. The corresponding yields of hay were 3.17 and 3.19 tons per acre.

Van Doren, Land, and Waggoner stated that the depressing effects of mulch on corn yield were overcome when the soil was fertilized. The average acre yield of corn on unmulched land on four farms in 1943 was 65 bushels per acre compared with 64 bushels for mulched land. Similarly the average acre yield of unmulched land on five farms in 1944 was 79.6 bushels per acre compared with a yield of 77.9 bushels per acre for mulched land.

Whitfield, Van Doren, and Johnson found that sub-tilled stubble mulch wheat out-yielded moldboard plowed and one-wayed wheat where wheat was grown continuously during the period 1942-48, inclusive, and that sub-tilled wheat out-yielded one-wayed wheat where wheat alternated with fallow during 1943-48, inclusive. Pullman silty clay loam was used in both sets of tests.

### Sub-tillage Benefits

The moldboard plowed wheat produced an average annual yield of 12.5 bushels per acre on the continuous wheat plots compared with 13.2 bushels for the one-wayed and 15.1 for the sub-tilled. The yield was 18.8 bushels per acre for the one-wayed and 21.6 for the sub-tilled plots where wheat alternated with fallow. The beneficial effects of sub-tillage were accumulative and the spread between the yields on the sub-tilled and moldboard and one-way plowed plots became progressively greater with time.

The stubble mulch plots also were slightly higher in organic matter content in 1948 than the one-way tilled plots.

Borst and Yoder found that alfalfa could be grown successfully on severely eroded, abandoned land without preparing the seedbed the customary way but by utilizing the poverty grass and broomsedge growth on such land as a mulch. The land was limed, fertilized, and disked so as to cut up the sod cover in such a way as to leave it on the surface as a mulch. Alfalfa grown by this method produced as large, or larger, yields of hay per acre as alfalfa grown on good land and cultivated by conventional methods.

Kurtz, Appleman, and Bray used

growing plants for surface protection in growing corn. Second-year red clover and sweet clover were turned under in narrow strips where corn rows were to be placed, and the clover between the rows was clipped close to the ground when the corn was planted. The sweet clover was killed by this clipping and remained as a mulch on the unplowed strips between the rows. A modification with oats as the intercrop was also included. In the red clover areas the clover grew tall enough to necessitate clipping, a month and again six weeks after the corn was planted. All plots under this corn-clover association were paired with adjacent plots which were spaded and cultivated to simulate the conventional seedbed preparation and management.

Three series of plots were used in connection with both red clover and sweet clover. One series was untreated, one received nitrogen fertilizer, and the other received nitrogen fertilizer and water. The corn yields for the different treatments are given in the following table:

YIELD OF CORN UNDER DIFFERENT MANAGEMENT SYSTEMS (BU. PER ACRE).

| Intercrop | Slit-crop system | Conventional system | Oats system | Intercrop | Slit-crop system | Conventional system | Oats system |
|---|---|---|---|---|---|---|---|
| Red clover..... | 69 | 126 | | Sweet clover.... | 116 | 132 | |
| Red clover+N.... | 102 | 125 | 110 | Sweet clover+N | 116 | 130 | 120 |
| Red clover+N+ water..... | 130 | 135 | | Sweet clover+N +water..... | 131 | 140 | |

Very limited trials with soybeans in the slit-cropping system were inconclusive. Although the yields were lower under the slit system, possibilities for good soybean yields were indicated whenever proper management techniques are developed. The corn yields doubtless would have been much higher on the slit-crop plots with red clover had the clover been clipped more often and the nitrogen and water applied at the proper time.

The advantages of a slit-cropping system may be great enough to warrant its use even though somewhat smaller yields may be obtained. This is particularly true for situations where erosion control and soil conservation are primary considerations. The possibility of reducing the plowing and cultivation currently necessary for corn production is sufficiently along to warrant further trials with a slit-cropping system.

The data presented here indicate that the most effective way to utilize crop residues and other vegetal covers is to keep them on the surface of the ground, rather than turn them under. The data also show that the proper use of these materials offers the most effective single measure of reducing erosion and runoff, and bringing about other desirable conditions in cultivated soils leading to continued high production.

Crop residues and other vegetal covers are more effective in building up the organic matter content of the soil when left on the surface than when turned under. They are also more effective in improving the aggregate structure and infiltration capacity of the soil when left on the surface. Surface utilization of these materials leads to substantial increases in crop yields in many instances. Further investigation doubtless will reveal satisfactory methods of overcoming the depressing effects of mulch covers on crop yields, where they occur, and lead to even greater increases under those conditions producing superior yields now. They offer an exceptional opportunity for bridging the gaps existing in crop rota-

tions where the covers from the rotation crops themselves do not furnish adequate protection from the destructive action of the falling raindrop.

The chief function of crop residues and other vegetal covers in reducing erosion is energy absorption or protection from raindrop impact, and not the impediment of overland flow. When left on the surface, vegetal covers deenergize the falling raindrop, thereby eliminating the destructive action of raindrop splash. This in turn prevents the chain of damaging reactions which the splashing raindrop sets in motion. To be sure, we do not have the final answer or answers to the correct use of crop residues, nor of other vegetal covers, in this capacity. We do have enough information, however, to indicate that these hold the key to the erosion control problem on cultivated land.

Our present situation in this connection may be compared with the Wright Brothers' first attempt to fly an airplane. The research data available to them indicated it was possible to build a machine that would fly. Once they proved their point research engineers busied themselves with building better machines. We now have found a practice that will control raindrop splash. Since our objective is to save our soil we have a far greater incentive for going ahead with a program which has for its aim more complete knowledge of the proper ways of utilizing crop residues and other vegetal covers in conserving our soil and water.

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**Fig. 4. Mulched wheat stubble on terraced, contour-cultivated field. The loosened soil readily accepts moisture and the stubble, shading the soil, helps prevent evaporation.**

# Band the Fertilizer for Best Results with Row Crops in Western Washington

*By Karl Baur and F. T. Tremblay*

Western Washington Experiment Station, Puyallup, Washington

INVESTIGATORS [1] working with soils and fertilizers in western Washington have known for years that many western Washington soils were low in available phosphorus. Yet when phosphate fertilizers were broadcast on the land the increases in yield often were very small. The response was much lower than they had a right to expect on the basis of soil tests. It was not until they began to apply the phosphate fertilizers in bands that the application of phosphates really began to pay off, particularly with row crops.

The work of investigators in many parts of the country has shown that the banding of fertilizers for good results is of great importance on some soils but of relatively little importance on other soils. The need for banding the fertilizers depends principally on the "phosphorus-fixing" capacity of the different soils. The mechanism of this "fixation" [2] is not thoroughly understood. The general opinion seems to be that iron and aluminum, which may be present in soluble forms in small amounts in acid soils, combine with the phosphate to form complex compounds of iron or aluminum phosphate which are quite insoluble and largely unavailable to rapidly growing plants. It is also believed by many that the phosphorus compounds are "adsorbed" or tightly held by the clay particles in the soil. There are a number of other ideas as to what takes place in phosphate fixation. Whatever the mechanism involved, plants often fail to utilize much of the phosphate that is applied broadcast on certain soils.

The problem of phosphate fixation appears to be of particular importance with short-season, annual crops under the soil and climatic conditions of western Washington. Although studies have not been completed, there is some evidence to indicate that the problem of phosphate fixation may not be as important with perennial crops such as fruit trees as it is with vegetable crops.

An attempt is made in the following paragraphs to explain what may happen to broadcast phosphate and why banded phosphate gives better results. We must keep in mind that when several hundred pounds of phosphate fertilizers are applied broadcast per acre, the phosphate particles are spread rather thinly; and when these are mixed with the surface three inches of soil as a result of discing, the phosphate applied is yet further diluted with soil. When 500 pounds of superphosphate are applied per acre, dilution with three to four inches of soil would mean that 500 pounds of superphosphate are mixed with almost a million pounds of soil. If the idea that iron and aluminum combine with phosphate to form rather insoluble phosphates is correct, it can be seen that these elements need not be present in large amounts for this chemical reaction to take place.

[1] All studies on fertilizer application in cooperation with G. A. Cumings, Sr., Agricultural Engineer, U. S. D. A., Beltsville, Maryland.

[2] For a detailed discussion of phosphate fixation the reader is referred to the book "Advances in Agronomy" Fixation of Soil Phosphorus, pp. 391-409.

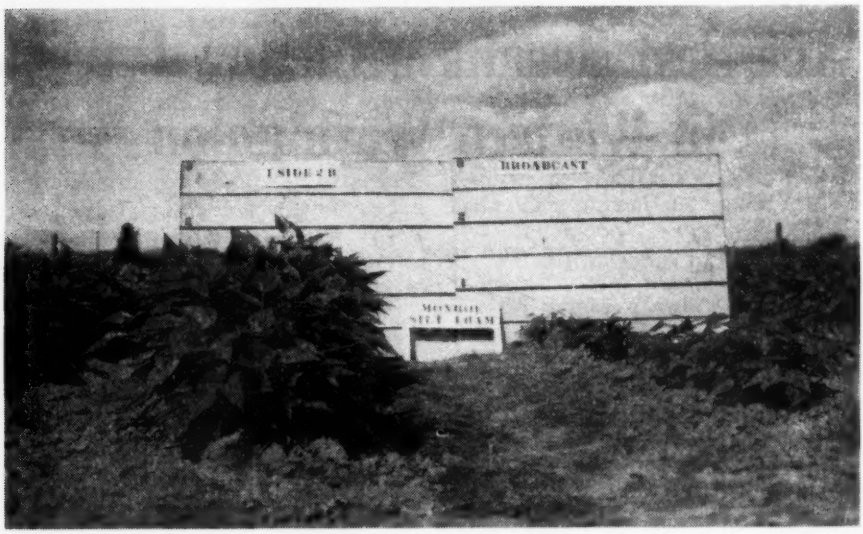


**Fig. 1. The response of Idaho Refugee beans from the application of 500 lbs. per acre of 5-15-10 placed in a band one inch to the side of and two inches deeper than the seed (left) and applied broadcast (right).**

We have attempted to illustrate what might happen to the broadcast phosphate (Figure 2). The phosphorus in each little particle could rather rapidly be combined with and coated with the insoluble or slowly soluble iron or aluminum compounds, or it could also be converted rapidly to the rather insoluble, slowly available tricalcium phosphate compound. Each particle of phosphate fertilizer in the broadcast treatment is completely surrounded by soil particles from which these "phosphate - fixing" solutions might come. There is experimental evidence to show that the finer the phosphate particle, the more intense the fixation may be. Granular phosphate fertilizers are said to be somewhat superior to the very fine phosphates on high "phos-

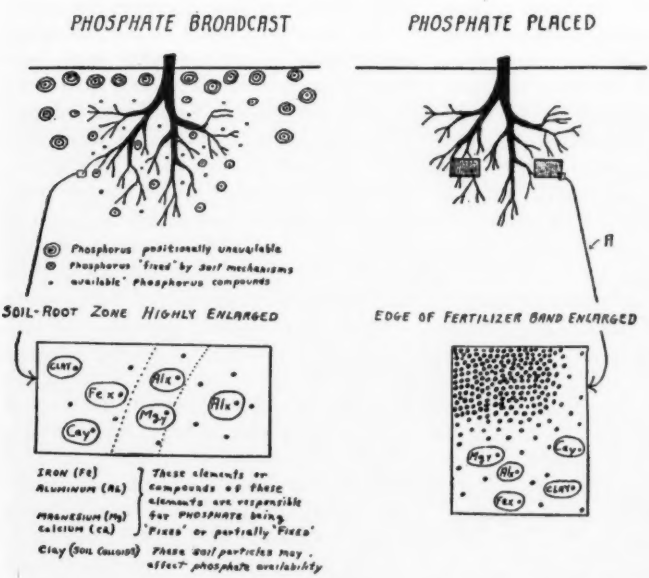
PHOSPHATE BROADCAST
PHOSPHATE PLACED
Phosphorus positionally unavailable
Phosphorus "fixed" by soil mechanisms
"available" phosphorus compounds
SOIL-ROOT ZONE HIGHLY ENLARGED
EDGE OF FERTILIZER BAND ENLARGED
IRON (Fe)
ALUMINUM (Al)
MAGNESIUM (Mg)
CALCIUM (Ca)
These elements or compounds of these elements are responsible for PHOSPHATE being "fixed" or partially "fixed"
Clay (Soil Colloid)
These soil particles may affect phosphate availability

**Fig. 2. What might happen when phosphate is broadcast and when it is placed.**

phorus-fixing" soils. The factors which may influence the comparative availability of fine and granular phosphates when applied to the soil are discussed in the next paragraph on band application.

When the phosphate fertilizers are applied in bands, the situation is quite different than when applied broadcast. A great part of the phosphate particles are not in contact with the soil particles, hence the phosphate cannot be "fixed" until it is carried in solution from the band out into the soil. The phosphate fertilizer in the band will partially decompose or go into solution in the soil water. This phosphorus-laden water will then move out into the soil surrounding the fertilizer band. The first of this water-soluble phosphorus that moves out of the band into the surrounding soil is probably fixed, but soon all of the free or soluble iron and aluminum has been used or tied up with phosphorus. Then the next quantity of phosphorus solution that moves into the soil is left in a form available to plants. We have reason to believe that this zone of soil surrounding the band and that has been saturated with phosphorus is the area from which plants obtain much of the phosphorus for their needs from the band-applied fertilizer.

Let us assume that we have a fertilizer band (Figure 2) in which heavy applications of phosphorus have been made. Let us assume further that this band of phosphate fertilizer has been in the soil for some time and that soil moisture has been present. The center core (A) in Figure 2 would represent the band-applied phosphate fertilizer, a part of which has broken down, and a part of which is still much as it was when it was originally applied. The dots within circles around the core represent the precipitated or combined iron and aluminum and tricalcium phosphates. The dots represent monocalcium and magnesium, potassium and ammonium phosphates, all of which are quite available to plants. As the distance from the core increases, the quantity of available or soluble phosphorus decreases and the insoluble forms increase in proportion.

There is another thought regarding the matter as to how the phosphorus is "fixed" or made unavailable. There is reason to believe that some of the phos-

**Fig. 3. Placing the fertilizer one inch deep and directly under the seed almost eliminated the stand of plants. When the band was placed at the same depth but one inch to the side of the seed excellent results were obtained.**

phorus is "adsorbed" or attracted to the very fine clay particles in the clay soil (Figure 2). This attraction may be so strong that the phosphorus is very difficult to remove by normal soil or soil plant-root processes. The amount of phosphorus fixed by "adsorption" apparently depends on the amount and kind of clay in the soil. In general it may be said that the greater the clay content, the more serious is phosphate fixation.

Broadcast phosphate may also be "positionally" unavailable to plants. When phosphate is disced into the soil some of the particles remain near the surface. The surface inch or two of soil dries very rapidly in regions of low summer rainfall. Roots obtain very little nourishment in the dry soil, therefore, the phosphorus in it is of little value to plants. Stirring the soil by cultivation also prevents the development of feeder roots in the surface soil so that the phosphate mixed with it is said to be "positionally" unavailable, since plant roots are not in contact with it.

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TABLE I.—DOLLAR VALUE OF FERTILIZER PLACEMENT FOR VEGETABLE CROPS IN WESTERN WASHINGTON.

| Crop | Year | Location and Soil series | Fertilizer | | Yield pounds per acre | | Pounds increase due | Value of per crop | Dollar value of increase due to band placement |
|---|---|---|---|---|---|---|---|---|---|
| | | | Kind | Pounds per acre | Fertilizer broadcast | Fertilizer placed | To fertilizer placement | Pounds in cents | |
| Beans, bush | 1944 | Puyallup Sultan | 5–15–10 | 500 | 7,300 | 11,000 | 3,700 | 5 | $185 |
| Beans, pole | 1949 | Puyallup Sultan | 5–15–10 | 500 | 11,657 | 15,919 | 4,262 | 5 | 213.10 |
| Beets, cannery | 1944 | Puyallup Sultan | 5–15–10 | 600 | 45,280 | 48,800 | 3,520 | 1 | 35.20 |
| Beets, seed | 1943 | Puyallup Sultan | 5–15–10 | 600 | 2,286 | 3,565 | 1,279 | 20 | 255.80 |
| Broccoli | 1949 | Puyallup Sultan | 10–10–10 | 600 | 7,864 | 9,589 | 1,725 | 6 | 103.50 |
| Cauliflower | 1949 | Puyallup Sultan | 10–10–10 | 600 | 16,647 | 19,628 | 2,981 | 2 | 59.62 |
| Cucumbers | 1946 | Puyallup Sultan | 10–20–20 | 400 | 7,120 | 22,300 | 15,180 | 3 | 455.40 |
| Peas, market | 1948 | Sequim Sequim | 5–20–20 | 300 | 9,700 | 12,500 | 2,800 | 10 | 280. |
| Peas, freezing | 1945 | Chehalis Chehalis | 0–20–20 | 300 | 2,274 | 2,656 | 382 | 5 | 19.10 |
| Spinach, cannery | 1943 | Puyallup Sultan | 10–20–20 | 400 | 4,812 | 8,126 | 3,314 | 2 | 66.28 |
| Sweet corn | 1948 | Puyallup Sultan | 5–20–10 | 400 | 8,320 | 10,440 | 2,120 | 1 | 21.20 |
| Swiss chard | 1943 | Puyallup Sultan | 10–20–20 | 400 | 59,150 | 65,980 | 6,830 | 15 | 1,024.50 |
| Potatoes | 1948 | Puyallup Sultan | 10–20–20 | 750 | 24,303 | 29,605 | 5,302 | 1 | 53.02 |

# Know Your Soil

## IV. Conestoga Silt Loam
## V. Collington Sandy Loam

*By J. B. Hester, F. A. Shelton, and R. L. Isaacs, Jr.*

Department of Agricultural Research, Campbell Soup Co., Riverton, New Jersey

FIVE years ago in cooperation with the American Potash Institute and the American Cyanamid Company a plan was instituted to apply a ton of 5-10-10 fertilizer, carrying 10 pounds of borax and 20 pounds of manganese sulfate per ton, each year on an acre of ground regardless of the crop grown. This was to be compared with the farmer's regular treatment. The plan was to make a complete analysis of the soil at the end of this period as well as to evaluate the fertility of the soil through greenhouse pot culture work to see what improvement had been made through the use of the fertilizer.

Two of these experiments, one near Lancaster and the other near New Providence, Pa., were located on Conestoga silt loams of similar analysis and characteristics. The rotation on the first soil was tomatoes, wheat, mixed hay, timothy, and corn. The other rotation was tomatoes, wheat, clover, potatoes, and tomatoes. The fertilizer was applied broadcast previous to plowing. The yields of all crops on the fertilized area were substantially higher than the grower's yields.

At the end of the five years, by means of a posthole digger, bulk samples of soil were taken from the plowed depth and the area immediately beneath it and brought to the greenhouse for pot culture work.

The chemical analyses of these soils at the end of the five years are shown in Tables I and II. Table I represents the soil with the two years of sod in the rotation. The original organic matter content of the topsoil was 2.1 per cent. This was increased to 2.9 per cent in the fertilized area and 2.8 per cent on the farmer's area as a result of the rotation. The organic matter content of the subsoil was increased from 0.8 to 1.1 per cent. On the basis of 2,000,000 pounds of soil in each horizon, that would be an increase in organic matter of 8,000 pounds per acre or an increase in nitrogen content of approximately 400 pounds per acre. Actually, 500 pounds of nitrogen per acre were applied during the five-year period.

It was noted that animals feeding on the grass concentrated their grazing in the fertilized area. Obviously, from this standpoint, the animals were getting better quality hay. Chemical analysis of the hay showed an increase in nitrogen, phosphorus, and potash. Data show that the calcium, phosphorus, potash, and manganese contents of the soil were substantially increased. It is possible that the fertilizer carried too much manganese for this soil. However, there was no indication of manganese toxicity. Data support the fact that the soil should analyze between one and five pounds of manganese per acre for best results.

The second rotation was located on a soil that analyzed 2.3 per cent organic matter in the plowed horizon in the beginning of the test. With only one sod crop in the five-year rotation, the

TABLE I.—SOIL TEST FOR FIRST CROP ROTATION.

| | | pH | Pounds per acre | | | | | | | % Organic matter | Ohms Resistance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CaO | MgO | Al | N as $NO_3$ | $P_2O_5$ | $K_2O$ | Mn | | Salt concentration |
| Experiment | Top soil | 6.7 | 1,650 | 270+ | 0.8 | 25 | 60+ | 219 | 1.5 | 2.9 | 1,150 |
| | Sub soil | 6.3 | 756 | 214 | 1.0 | 14 | 35 | 25 | 8.2 | 1.1 | 1,550 |
| Farm Acre | Top soil | 6.3 | 480 | 270+ | 1.5 | 30 | 37 | 91 | 1.4 | 2.8 | 1,500 |
| | Sub soil | 6.3 | 146 | 214 | 2.1 | 24 | 40 | 16 | 0.4 | 0.8 | 1,550 |

grower only maintained his organic matter content with his method of fertilization, whereas both the top and subsoil in the fertilized area analyzed 0.3 per cent more organic matter. This amounts to 12,000 pounds of organic matter or approximately 600 pounds of nitrogen per acre. The plant debris from each crop returned considerably more organic matter on the fertilized area. The clover made a substantially larger growth and undoubtedly accounts for a large part of the nitrogen fixation. On the potato crop, the grower used an additional 1,500 pounds of 5-10-10 fertilizer across the fertilized area and an additional 1,000 pounds on the tomatoes, meaning that 625 pounds of nitrogen were actually added to this area during the five-year period. Here again, the calcium, phosphorus, potash, and manganese contents of the soil were substantially increased over the farmer's area, Table II.

When these soils, at the end of the five-year period, were placed in three-gallon coffee-urn-liner pots and planted with tomatoes, the fertilized soil gave

TABLE II.—SOIL TEST FOR SECOND CROP ROTATION.

| | | pH | Pounds per acre | | | | | | | % Organic matter | Ohms Resistance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CaO | MgO | Al | N as $NO_3$ | $P_2O_5$ | $K_2O$ | Mn | | Salt concentration |
| Experiment | Top soil | 6.1 | 1,180 | 232 | 1.1 | 16 | 60 | 240 | 6 | 2.6 | 1,500 |
| | Sub soil | 5.7 | 280 | 232 | 1.6 | 68 | 23 | 360+ | 11 | 0.8 | 160 |
| Farm Acre | Top soil | 5.9 | 812 | 270 | 0.4 | 18 | 35 | 102 | 1 | 2.3 | 1,150 |
| | Sub soil | 6.2 | 636 | 270 | 2.1 | 11 | 52 | 52 | 2 | 0.5 | 1,200 |

Hester extraction method.

substantially better yields than the soil from the farmer's area even when additional fertilizer was added to both.

Figure I shows the results of tomatoes grown under greenhouse conditions on the soil from the first crop rotation. Pot 1 represents the grower's area and pot 11 represents the fertilized area without additional fertilizer. Pot 10 represents the grower's area with additional fertilizer for pot culture and the pot on the extreme right represents the fertilized area with the same additional fertilizer treatment as pot 10. The improvement of the soil is evident from this work. The yields of tomatoes on these pots were 596, 795, 1244, and 1404 grams per pot, respectively.

It is clearly brought out by these data that on this particular soil type with these rotations the addition of commercial fertilizer had substantially increased the fertility of the soil.

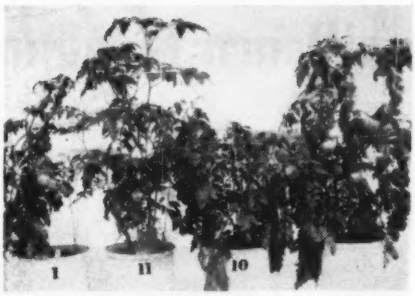


**Fig. 1. Pots 1 and 10—grower's area without and with additional fertilizer. Pot 11 and one on extreme right—fertilized area without and with additional fertilizer.**

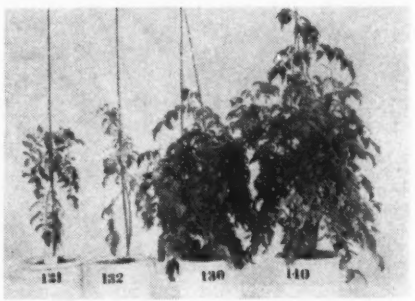


**Fig. 2. Pots 121 and 130—grower's area without and with additional fertilizer. Pots 132 and 140—fertilized area without and with additional fertilizer.**

### Collington Sandy Loam

Located near Marlton, N. J., is a Collington sandy loam on which a ton of 5-10-10 fertilizer per acre has been applied broadcast previous to plowing each year for five years. This soil has been in a rotation of continuous cash crops, namely, tomatoes, tomatoes, sweet corn, rye, and tomatoes. The fertilized acre has yielded substantially increased yields over the grower's acre on all crops.

The analysis of the soil at the end of the five-year period is given in Table III.

With a continuous cash crop program, as followed on this particular soil, the fertilizer did not increase the organic matter content of the soil in either the top or subsoil. The phosphoric acid and potash contents were increased, but because of the heavier growth made on the fertilized area, the magnesium content was decreased. The pH of the soil was increased from 5.5 to 6.2 by the addition of lime. Undoubtedly the lower pH value in the subsoil was due to the leaching of nitrate nitrogen into this area. Unlike the Conestoga silt loam, the manganese content remained low.

Pot culture work was conducted in the greenhouse using both top and subsoil from the fertilized area and the farmer's acre. Figure 2 illustrates the fact that this soil was not built up very greatly by the fertilizer treatment. Pot 121 represents the farmer's acre and pot 132 the fertilized area without any additional treatment. Pot 130 represents the farmer's acre and 140 the fertilized area, both with additional fertilizer. The relative yields of tomatoes were 106, 197, 672, and 812 grams per pot, respectively.

This work, along with that on the Conestoga silt loam, indicates that in order to properly fertilize and farm a soil, it is essential that one understands

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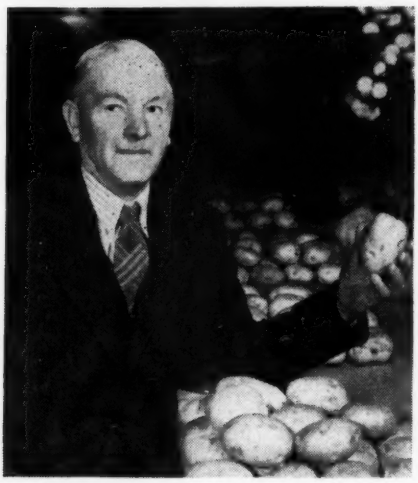
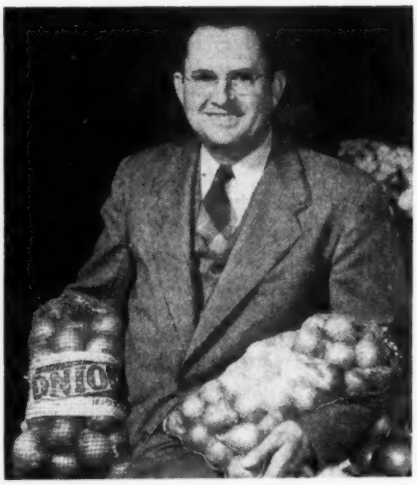
# Indiana Muck Crop Champions

*By Roscoe Fraser*

Vegetable Specialist, Agricultural Extension Service, Purdue University, Lafayette, Ind.



Henry W. Emme—762.55 bu. per A.



Fred Fraser—591 bu. per A.

IN the last 15 years there has been a great development in the 300,000 acres of muck land in northern Indiana.

Not too long ago most of this muck soil was wasteland. Loan companies would not loan money on farms which had very much muck soil on them, and muck farming did not rate very high as an agricultural enterprise. In fact, Indiana's Gov. Schricker says he can remember when bullfrogs were legal tender for the farmers in this area when he was a boy. Some of the farmers gathered bullfrogs in the muck swamps and shipped them by the sackful to Chicago. They then took their express receipts to the local grocer who gave them groceries on these receipts.

Today these muck fields (organic swampland deposits ranging from three to ninety feet deep) are being used to produce high yields of quality potatoes, onions, corn, peppermint, sweet corn, carrots, cabbage, and other vegetables. Many of these comparatively new muck farmers are completely sold on this type of farming and they are anxious to get the newest scientific information on farming muck soil.

### Champion 400-bushel Potato Club Grower

Champion potato grower, Henry W. Emme of Butler, Indiana, produced the highest official yield of potatoes ever recorded in the Indiana 400-bushel Potato Club when he grew 762.55 bushels on the best acre of his 17 acres in 1949.

A. & M. Ruderman, Huntertown, were second with a yield of 729.23 bushels; and Gerald Schlictmeyer, Kendallville, was third with a yield of 680.62 bushels.

To win the potato championship,

(*Turn to page* 48)

# Royce Mitchell Succeeds with Complete-farm Plan

*By Gordon Webb*

Soil Conservation Service, Spartanburg, South Carolina

FOR generations the orators and the editors have been telling us about the New South, a promised land just beyond what we had at the moment. And we've read fine prose about the beauty and beneficence of grass. Agriculturally, today you'll find the New South on Royce W. Mitchell's farm near Tylertown, in South Mississippi. You'll also find grasses and clovers at their best, giving year-around green grazing to top-quality grade and registered Herefords.

Seven years ago, this tall, tanned young farmer with the "smile wrinkles" around his deep-set brown eyes started planned grassland farming. Then, he was a cotton farmer, with a few cattle on native pastures and field gleanings in the fall and winter.

Today he's a livestock farmer. Cotton is gone from his 232 acres, even from the field where he used to pick a bale of cotton to the acre. And it's happened in Walthall County where 10 years ago few people believed you could grow improved pastures. Today, there are more than 32,000 acres of good pasture sods in the county.

Mitchell's farm is in the Knoxo community, where some of the county's first really good pastures were "made." On my first trip to the farm in 1946, the pasture work was getting off to a good start. His pride then (and now) was a 15-acre Dallis grass-white clover pasture. That's his first pasture, now seven years old and as productive as ever.

After going over that lush pasture in 1946, I asked what kind of pasture they had before they began soil conservation farming with help from the district. Royce Mitchell or his brother Gene who farms and also runs the Knoxo community store answered this way: "Well, before we got these good pastures, our cows had to cooperate to make a living on our woods pastures. One cow would bend over a blackjack oak tree while her partner ate off the leaves. Any cow without a partner stood a chance of starvation!"

When I went back to see Royce Mitchell last June, I reminded him of that story.

Maybe the grazing was a little better than that, he told me with a grin. But his present-day pastures of improved grasses and legumes do put the old native pastures "in the shade." And, on a hot day, you'll find his fat Herefords hunting the shade of pines or scattered oak trees by 9 A. M., after grazing their fill.

### A Pasture Formula

Mitchell's formula for good pasture sod runs like this:

First, put the right legume or grass or combination of grasses and legumes on the right land. A complete-farm soil and water conservation plan made that possible.

Second, prepare the land well and use plenty of minerals.

Third, use good seed in adequate quantities.

Fourth, maintain the pastures by mowing, fertilizing, and rotation grazing. That, he told me, is the secret of keeping a heavy pasture sod seven years. And he wants to see how long

that pasture will stay there without plowing or reseeding.

His grazing plants now include, in addition to Dallis grass and white clover: Pensacola Bahia and Kentucky 31 fescue grasses, sericea lespedeza, Alyce and crimson clover, kudzu, and oats.

When I asked Mitchell how these plants fit into a year-around green grazing program, he thought a minute and decided to start with the oats and the fescue.

"We have the oats and fescue for grazing from about December 1 to March 15," he said. "Crimson clover on the sericea will provide grazing from about February 1 to May 1. Dallis grass-white Dutch clover, Bahia grass, and sericea fill in from about March 15 to about December 1. If we need it, the Alyce clover can be grazed in September and October."

Mitchell's kudzu is young. It is planted mostly on steep slopes cleared last year of brush and scattered trees. How will it fit into the grazing schedule?

"There will be dry years when we need a little more grazing in August and September," Mitchell replied. "It gets a little dry then. I think the kudzu will fill the gap."

The hard-working farmer saves "a little hay" just in case it's needed. Last year he had 1,100 bales of annual lespedeza hay. "We put out about half of the hay during the winter, but most of it was just wasted," he said. "Our cattle walked off and left it."

### Maintenance Fertilization

After looking over the seven-year-old pasture, I asked Mitchell about maintenance fertilization. That 15-acre pasture, he said, receives the following minerals every year: One ton of calcium silicate slag, 400 pounds of 20 per cent phosphate, and 100 pounds of muriate of potash to the acre.

I then asked him about maintenance fertilization of the Pensacola Bahia grass, the white clover, the sericea, and the oats. They get exactly the same fertilization, except when he wants to harvest grass seed or grain. That calls for nitrogen, too.

He is giving his five-acre Bahia pasture a heavy shot of nitrogen, hoping to get 200 pounds of seed to the acre. Early in the spring he spreads 150 pounds of ammonium nitrate to the acre. When I talked with him late in June he was planning to remove cattle from the grass, clip it to let all the seed heads come at the same time, apply another 150 pounds of ammonium nitrate, and wait for a seed crop.

Later Mitchell took me to see the Bahia. It was planted in January or February 1945, with white clover.

"Bahia makes such a dense sod that the white clover is almost gone," he pointed out. The knee-high grass, in almost a pure stand because it has crowded out practically everything else including most weeds, already was sending up a few seed spikes. R. Y. Bailey, Management Agronomist for the Soil Conservation Service in the Southeast, believes that reseeding crimson clover is the legume to grow with Bahia. The grass will have to be grazed or clipped closely in the late summer to permit the clover to volunteer.

"Until this year I wasn't enthusiastic about Bahia," Mitchell told me. That was before he put on the ammonium nitrate. "I've just begun to realize that I have something valuable here."

Mitchell was one of the first farmers to receive some muriate of potash through the Walthall County District. He used it in 1945 in planting the five acres of Bahia and white clover and five acres of Dallis grass and white clover.

"That's when I began to realize that we had to have potash for our clovers," he told me. "For one thing, my cows just stayed on the pasture where I used the potash. Then I got some more potash through the district, and put it on half of my older Dallis grass-white Dutch clover pasture in 1945. You

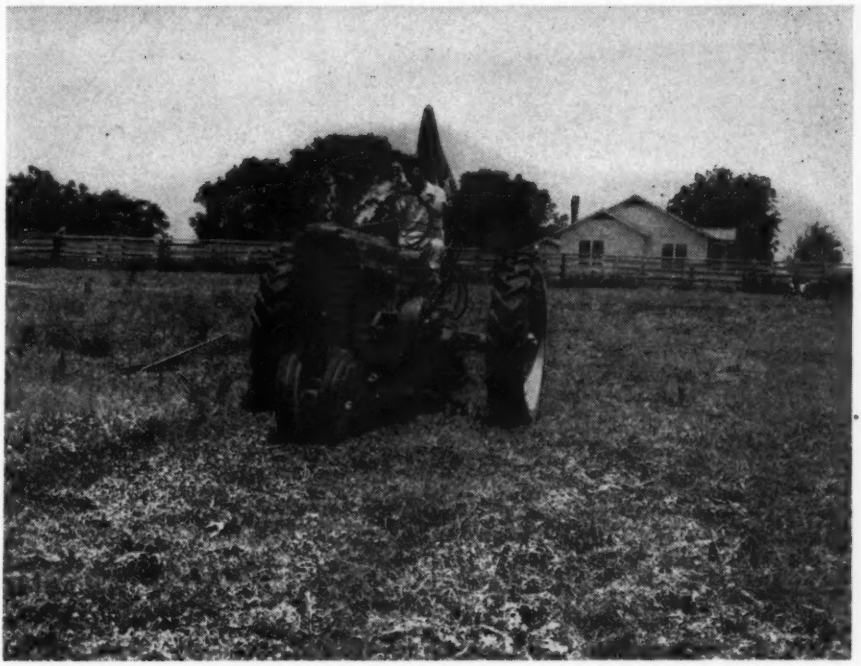
(*Turn to page* 46)

**Above:** Royce Mitchell and his 14-year-old son William in their 20-acre pasture of first-year Kentucky 31 fescue (Suiter's grass). Here is winter grazing.

**Below:** Mitchell's oldest pasture, a seven-year-old sod of white clover and Dallis grass, is kept good by mowing, regular and liberal use of minerals, and rotation grazing.

**Above: This is volunteer white clover, a part of 23 acres where oats were grown last fall and winter for grazing.**

**Below: Mitchell keeps some bees to insure a better clover and seed crop and for honey for the table.**

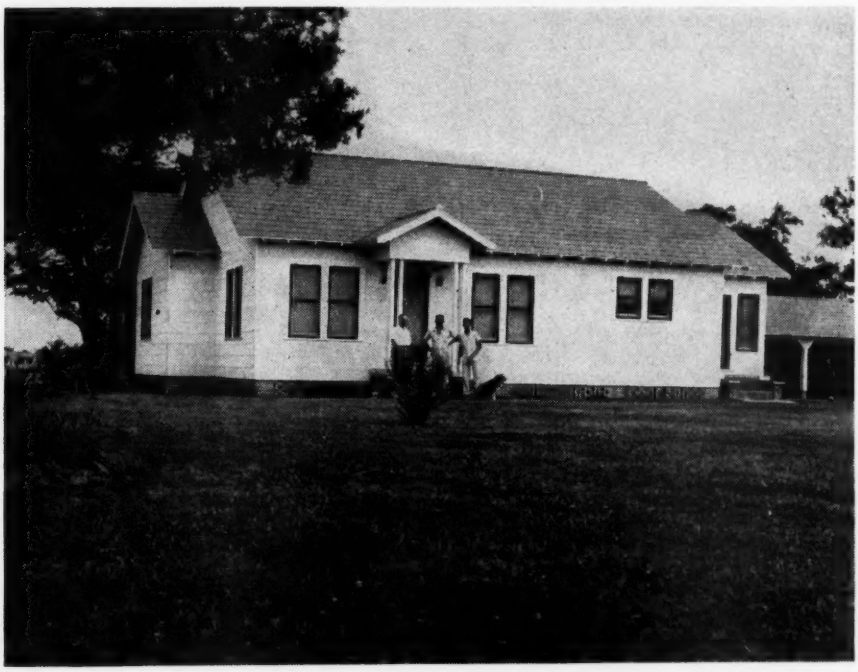


**Above: Pastures are mowed two to four times a year to keep them producing forage high in protein.**

**Below: Good pastures have to be made and kept that way. Here manure is being spread on galled spots.**

**Above: And there is fun right at home. Bass and bream abound in the two livestock and fish ponds on the farm.**

**Below: The Mitchell's new home—the payoff in better living on better land.**



# The Editors Talk

## An Important Anniversary

On September 28-29 the Connecticut Agricultural Experiment Station celebrated its 75th anniversary. This was more than "just another birthday" for it commemorated the establishment of the first agricultural experiment station in America and the oldest institution of its kind in the Western Hemisphere.

More than 200 delegates, representing agriculture and science in this country and abroad, attended the two days of fitting ceremonies. Talks and a symposium on "The Research Institute in Modern Society" paid tribute to the march of science not only in agriculture but in allied industries. Arnold Nicholson, Managing Editor of the Country Gentlemen, in tracing the history of the agricultural experiment station movement since the establishment of the first station in Connecticut in 1875, said, "It would be hard to find, in history's pages, a development as perfectly matched to the times as the flowering of the agricultural experiment station idea in the last quarter of the 19th century. That was when we built the foundation for the industrial might that makes this nation great today; and our complex of iron and steel, steam power and transportation grew on the release of manpower from the land. Science and mechanical invention were the means for that release."

He pointed out that in 1875 there were eight Americans employed directly in agriculture for every ten in other pursuits. By 1917, only one American in four was engaged in farming and today the figure is one in fourteen and a half. Along with the industrial revolution and the movement of workers from the farms to the cities came specialization in farming, beginning in New England and spreading across the continent. Specialization brought problems unknown before. With the concentration of crops and animals in given areas, new questions about fertility and disease arose, and the discovery of breeds and varieties to meet special market needs grew in importance. Not only did the experiment stations keep pace, but in many instances their discoveries determined the futures of whole regions. Today, the findings of the stations influence and benefit nearly every farm family in the land, and the farmer's faith has been won by the experiment stations for their answers to his production problems.

Looking ahead, Mr. Nicholson is of the opinion that the next great task before the stations is that of bending their efforts to aid the farmer in his problems of processing and distribution. "There is gloom in the marketing field," he said, "and farmers would prefer the light of science to political tampering with our economic system. While some work is already under way through the provisions of the Research and Marketing Act, more needs to be accomplished to meet the needs of the situation."

Will another 75 years of agricultural experiment stations mean as much to American agriculture as the past 75-year period? Our guess is—yes. With science playing an ever-increasing role in the well-being of our daily lives, we have as much or more need for "proven results" today as we did in 1875. And we wish we might be around when the Connecticut Station celebrates its 150th anniversary!

## Weeds? As Soil-builders?

The dictionary defines a weed as any plant growing in cultivated ground to the detriment of the crop or to the disfigurement of the place; an economically useless or unsightly plant. Now comes a release from the New Jersey Agricultural Experiment Station stating that some day you may be proud of the weeds growing in your garden or on your farm.

The statement is based on the fact that Dr. Firman E. Bear, Head of the Soils Department at Rutgers University, is not so sure that all weeds are the villains they have been made out to be. He thinks there is reason to believe that many weeds make highly important contributions in mobilizing minor elements in the soil.

For example, ragweed and lamb's quarter, two common weeds, are excellent accumulators of zinc. Dr. Bear holds that they might be deliberately grown for the purpose of restoring that element to a zinc-deficient soil. He mentioned weeds in pleading the cause of more organic material in the soil at the annual conference of fertilizer manufacturers and dealers at the New Jersey College of Agriculture on September 28. There is need, he said, not only for getting more organic matter into the soil, but a variety of kinds of organic matter. Certain weeds may provide this variety.

We personally hope that a necessity for the cultivation of weeds may be a long way off. And we liked his emphasis on the fact that right now the most important thing to be done toward maintaining organic matter and good soil structure is to plant a mixed grass and legume crop once every third or fourth year. Then fertilize it liberally and keep it on the land at least one full year.

## Foundation Seed Program

Organized by the State Agricultural Experiment Stations and the U. S. Department of Agriculture, the Foundation Seed Program bids fair to become a very important aid in the conversion to grassland farming so greatly needed on millions of acres of our croplands. One of the chief obstacles to farmers who have wanted to grow more forage has been the scarcity and high prices of grass and legume seed.

The objective of the program is to make available and maintain adequate supplies of foundation seed stocks of superior varieties of grasses and legumes and to preserve their identity through seed certification. Too often after expensive and laborious preparation for grassland farming, growers have experienced failures because of unreliable or unadapted seed.

The program is now well under way with 30 states cooperating. Local seed certification agencies and qualified specialists visit seed-producing areas to study improved selections which may prove useful in other sections of the country for feeding and for soil improvement. Last year, under the program, the production of foundation seed stocks of Tift Sudan grass, Kenland red clover, and Atlantic alfalfa, which originated in New Jersey, was begun. It is hoped that by this fall there will be enough seed of Tift Sudan grass to keep it in adequate supply. Supplies of about 50,000 pounds of Kenland red clover and 2,500 pounds of Atlantic alfalfa are expected. Other new varieties are being brought into the program as it develops, against the goal that within the next few years all the improved varieties of forage crops will be available to farmers at reasonable prices.

It is planned activity such as this which helps keep the future of our agriculture looking bright.

## Season Average Prices Received by Farmers for Specified Commodities *

| Crop Year | Cotton Cents per lb. Aug.-July | Tobacco Cents per lb. ..... | Potatoes Cents per bu. July-June | Sweet Potatoes Cents per bu. July-June | Corn Cents per bu. Oct.-Sept. | Wheat Cents per bu. July-June | Hay[1] Dollars per ton July-June | Cottonseed Dollars per ton July-June | Truck Crops .... |
|---|---|---|---|---|---|---|---|---|---|
| Av. Aug. 1909–July 1914.... | 12.4 | 10.0 | 69.7 | 87.8 | 64.2 | 88.4 | 11.87 | 22.55 | .... |
| 1925..... | 19.6 | 16.8 | 170.5 | 165.1 | 69.9 | 143.7 | 12.77 | 31.59 | .... |
| 1926..... | 12.5 | 17.9 | 131.4 | 117.4 | 74.5 | 121.7 | 13.24 | 22.04 | .... |
| 1927..... | 20.2 | 20.7 | 101.9 | 109.0 | 85.0 | 119.0 | 10.29 | 34.83 | .... |
| 1928..... | 18.0 | 20.0 | 53.2 | 118.0 | 84.0 | 99.8 | 11.22 | 34.17 | .... |
| 1929..... | 16.8 | 18.3 | 131.6 | 117.1 | 79.9 | 103.6 | 10.90 | 30.92 | .... |
| 1930..... | 9.5 | 12.8 | 91.2 | 108.1 | 59.8 | 67.1 | 11.06 | 22.04 | .... |
| 1931..... | 5.7 | 8.2 | 46.0 | 72.6 | 32.0 | 39.0 | 8.69 | 8.97 | .... |
| 1932..... | 6.5 | 10.5 | 38.0 | 54.2 | 31.9 | 38.2 | 6.20 | 10.33 | .... |
| 1933..... | 10.2 | 13.0 | 82.4 | 69.4 | 52.2 | 74.4 | 8.09 | 12.88 | .... |
| 1934..... | 12.4 | 21.3 | 44.6 | 79.8 | 81.5 | 84.8 | 13.20 | 33.00 | .... |
| 1935..... | 11.1 | 18.4 | 59.3 | 70.3 | 65.5 | 83.2 | 7.52 | 30.54 | .... |
| 1936..... | 12.4 | 23.6 | 114.2 | 92.9 | 104.4 | 102.5 | 11.20 | 33.36 | .... |
| 1937..... | 8.4 | 20.4 | 52.9 | 78.0 | 51.8 | 96.2 | 8.74 | 19.51 | .... |
| 1938..... | 8.6 | 19.6 | 55.7 | 69.8 | 48.6 | 56.2 | 6.78 | 21.79 | .... |
| 1939..... | 9.1 | 15.4 | 69.7 | 73.4 | 56.8 | 69.1 | 7.94 | 21.17 | .... |
| 1940..... | 9.9 | 16.0 | 54.1 | 85.4 | 61.8 | 68.2 | 7.59 | 21.73 | .... |
| 1941..... | 17.0 | 26.4 | 80.8 | 92.2 | 75.1 | 94.4 | 9.70 | 47.65 | .... |
| 1942..... | 19.0 | 36.9 | 117.0 | 118.0 | 91.7 | 110.0 | 10.80 | 45.61 | .... |
| 1943..... | 19.9 | 40.5 | 131.0 | 206.0 | 112.0 | 136.0 | 14.80 | 52.10 | .... |
| 1944..... | 20.7 | 42.0 | 150.0 | 190.0 | 109.0 | 141.0 | 16.50 | 52.70 | .... |
| 1945..... | 22.5 | 36.6 | 143.0 | 204.0 | 127.0 | 150.0 | 15.10 | 51.10 | .... |
| 1946..... | 32.6 | 38.2 | 124.0 | 218.0 | 156.0 | 191.0 | 16.70 | 72.00 | .... |
| 1947..... | 31.9 | 38.0 | 162.0 | 217.0 | 216.0 | 229.0 | 17.60 | 85.90 | .... |
| 1948..... | 31.0 | 38.7 | 153.0 | 219.0 | 136.0 | 205.0 | 19.00 | 67.80 | .... |
| 1949 | | | | | | | | | |
| October..... | 28.70 | 47.4 | 130.0 | 196.0 | 109.0 | 189.0 | 16.75 | 41.80 | .... |
| November... | 27.76 | 43.4 | 134.0 | 189.0 | 102.0 | 190.0 | 16.75 | 42.30 | .... |
| December.... | 26.50 | 45.4 | 131.0 | 202.0 | 113.0 | 193.0 | 17.15 | 43.30 | .... |
| 1950 | | | | | | | | | |
| January..... | 26.47 | 39.7 | 136.0 | 215.0 | 115.0 | 192.0 | 17.15 | 43.60 | .... |
| February.... | 27.50 | 34.1 | 133.0 | 221.0 | 116.0 | 193.0 | 16.75 | 43.60 | .... |
| March..... | 28.05 | 32.0 | 132.0 | 222.0 | 119.0 | 198.0 | 16.45 | 43.00 | .... |
| April..... | 28.74 | .... | 134.0 | 228.0 | 126.0 | 201.0 | 16.65 | 44.40 | .... |
| May..... | 29.24 | 48.5 | 128.0 | 228.0 | 134.0 | 204.0 | 17.25 | 45.20 | .... |
| June..... | 29.91 | 49.7 | 127.0 | 211.0 | 136.0 | 193.0 | 16.05 | 46.20 | .... |
| July..... | 33.05 | 45.5 | 127.0 | 208.0 | 144.0 | 199.0 | 15.15 | 52.00 | .... |
| August..... | 36.95 | 53.1 | 122.0 | 218.0 | 144.0 | 197.0 | 15.45 | 70.90 | .... |
| September... | 39.98 | 55.4 | 105.0 | 192.0 | 144.0 | 194.0 | 15.55 | 78.80 | .... |
| **Index Numbers (Aug. 1909—July 1914 = 100)** | | | | | | | | | |
| 1925..... | 158 | 168 | 245 | 188 | 109 | 163 | 108 | 140 | 143 |
| 1926..... | 101 | 179 | 189 | 134 | 116 | 138 | 112 | 98 | 139 |
| 1927..... | 163 | 207 | 146 | 124 | 132 | 135 | 87 | 154 | 127 |
| 1928..... | 145 | 200 | 76 | 134 | 131 | 113 | 95 | 152 | 154 |
| 1929..... | 135 | 183 | 189 | 133 | 124 | 117 | 92 | 137 | 137 |
| 1930..... | 77 | 128 | 131 | 123 | 93 | 76 | 93 | 98 | 129 |
| 1931..... | 46 | 82 | 66 | 83 | 50 | 44 | 73 | 40 | 115 |
| 1932..... | 52 | 105 | 55 | 62 | 50 | 43 | 52 | 46 | 102 |
| 1933..... | 82 | 130 | 118 | 79 | 81 | 84 | 68 | 57 | 91 |
| 1934..... | 100 | 213 | 64 | 91 | 127 | 96 | 111 | 146 | 95 |
| 1935..... | 90 | 184 | 85 | 80 | 102 | 94 | 63 | 135 | 119 |
| 1936..... | 100 | 236 | 164 | 106 | 163 | 116 | 94 | 148 | 104 |
| 1937..... | 68 | 204 | 76 | 89 | 81 | 109 | 74 | 87 | 110 |
| 1938..... | 69 | 196 | 80 | 79 | 76 | 64 | 57 | 97 | 88 |
| 1939..... | 73 | 154 | 100 | 84 | 88 | 78 | 67 | 94 | 91 |
| 1940..... | 80 | 160 | 78 | 97 | 96 | 77 | 64 | 96 | 111 |
| 1941..... | 137 | 264 | 116 | 105 | 117 | 107 | 82 | 211 | 129 |
| 1942..... | 153 | 369 | 168 | 134 | 143 | 124 | 91 | 202 | 163 |
| 1943..... | 160 | 405 | 188 | 235 | 174 | 154 | 125 | 231 | 245 |
| 1944..... | 167 | 420 | 214 | 216 | 170 | 160 | 139 | 234 | 212 |
| 1945..... | 181 | 366 | 205 | 232 | 198 | 170 | 127 | 227 | 224 |
| 1946..... | 263 | 382 | 178 | 248 | 212 | 209 | 141 | 319 | 204 |
| 1947..... | 257 | 380 | 232 | 248 | 336 | 259 | 148 | 381 | 249 |
| 1948..... | 250 | 387 | 220 | 249 | 212 | 232 | 160 | 301 | 238 |
| 1949 | | | | | | | | | |
| October..... | 231 | 474 | 187 | 224 | 170 | 214 | 141 | 185 | 170 |
| November... | 224 | 434 | 192 | 216 | 159 | 215 | 141 | 188 | 213 |
| December.... | 214 | 454 | 188 | 230 | 176 | 218 | 144 | 192 | 196 |
| 1950 | | | | | | | | | |
| January..... | 213 | 397 | 195 | 245 | 179 | 217 | 144 | 193 | 261 |
| February.... | 222 | 341 | 191 | 252 | 181 | 218 | 141 | 193 | 203 |
| March..... | 226 | 320 | 189 | 253 | 185 | 224 | 139 | 191 | 168 |
| April..... | 232 | ... | 192 | 260 | 196 | 227 | 140 | 197 | 205 |
| May..... | 236 | 485 | 184 | 260 | 209 | 231 | 145 | 200 | 178 |
| June..... | 241 | 497 | 182 | 240 | 212 | 218 | 135 | 205 | 182 |
| July..... | 267 | 455 | 182 | 237 | 224 | 225 | 128 | 231 | 200 |
| August..... | 298 | 531 | 175 | 248 | 224 | 223 | 130 | 314 | 164 |
| September... | 322 | 554 | 151 | 219 | 224 | 219 | 131 | 349 | 126 |

## Wholesale Prices of Ammoniates

| | Nitrate of soda bulk per unit N | Sulphate of ammonia bulk per unit N | Cottonseed meal S. E. Mills per unit N | Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N | Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N | High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N |
|---|---|---|---|---|---|---|
| 1910–14 | $2.68 | $2.85 | $3.50 | $3.53 | $3.37 | $3.52 |
| 1925 | 3.11 | 2.47 | 5.41 | 5.34 | 3.97 | 4.75 |
| 1926 | 3.06 | 2.41 | 4.40 | 4.95 | 4.36 | 4.90 |
| 1927 | 3.01 | 2.26 | 5.07 | 5.87 | 4.32 | 5.70 |
| 1928 | 2.67 | 2.30 | 7.06 | 6.63 | 4.92 | 6.00 |
| 1929 | 2.57 | 2.04 | 5.64 | 5.00 | 4.61 | 5.72 |
| 1930 | 2.47 | 1.81 | 4.78 | 4.96 | 3.79 | 4.58 |
| 1931 | 2.34 | 1.46 | 3.10 | 3.95 | 2.11 | 2.46 |
| 1932 | 1.87 | 1.04 | 2.18 | 2.18 | 1.21 | 1.36 |
| 1933 | 1.52 | 1.12 | 2.95 | 2.86 | 2.06 | 2.46 |
| 1934 | 1.52 | 1.20 | 4.46 | 3.15 | 2.67 | 3.27 |
| 1935 | 1.47 | 1.15 | 4.59 | 3.10 | 3.06 | 3.65 |
| 1936 | 1.53 | 1.23 | 4.17 | 3.42 | 3.58 | 4.25 |
| 1937 | 1.63 | 1.32 | 4.91 | 4.66 | 4.04 | 4.80 |
| 1938 | 1.69 | 1.38 | 3.69 | 3.76 | 3.15 | 3.53 |
| 1939 | 1.69 | 1.35 | 4.02 | 4.41 | 3.87 | 3.90 |
| 1940 | 1.69 | 1.36 | 4.64 | 4.36 | 3.33 | 3.39 |
| 1941 | 1.69 | 1.41 | 5.50 | 5.32 | 3.76 | 4.43 |
| 1942 | 1.74 | 1.41 | 6.11 | 5.77 | 5.04 | 6.76 |
| 1943 | 1.75 | 1.42 | 6.30 | 5.77 | 4.86 | 6.62 |
| 1944 | 1.75 | 1.42 | 7.68 | 5.77 | 4.86 | 6.71 |
| 1945 | 1.75 | 1.42 | 7.81 | 5.77 | 4.86 | 6.71 |
| 1946 | 1.97 | 1.44 | 11.04 | 7.38 | 6.60 | 9.33 |
| 1947 | 2.50 | 1.60 | 12.72 | 10.66 | 12.63 | 10.46 |
| 1948 | 2.86 | 2.03 | 12.94 | 10.59 | 10.84 | 9.85 |
| 1949 | 3.15 | 2.29 | 10.11 | 13.18 | 10.73 | 10.62 |
| October | 3.08 | 2.32 | 9.94 | 14.58 | 11.29 | 11.65 |
| November | 3.00 | 2.32 | 10.39 | 14.21 | 10.39 | 10.78 |
| December | 3.00 | 2.32 | 12.94 | 13.88 | 9.87 | 9.94 |
| 1950 | | | | | | |
| January | 3.00 | 2.32 | 10.27 | 13.79 | 10.26 | 10.08 |
| February | 3.00 | 2.32 | 9.37 | 13.45 | 8.96 | 8.96 |
| March | 3.00 | 2.32 | 9.70 | 13.01 | 10.17 | 9.34 |
| April | 3.00 | 2.32 | 10.34 | 12.58 | 10.39 | 8.19 |
| May | 3.00 | 2.05 | 10.74 | 11.97 | 10.14 | 7.59 |
| June | 3.00 | 1.71 | 10.55 | 10.79 | 9.41 | 7.36 |
| July | 3.00 | 1.71 | 11.53 | 10.71 | 9.35 | 8.74 |
| August | 3.00 | 1.71 | 11.44 | 11.06 | 10.62 | 9.87 |
| September | 3.00 | 1.71 | 11.44 | 10.85 | 10.85 | 10.32 |
| **Index Numbers (1910-14 = 100)** | | | | | | |
| 1925 | 115 | 87 | 155 | 151 | 117 | 135 |
| 1926 | 113 | 84 | 126 | 140 | 129 | 139 |
| 1927 | 112 | 79 | 145 | 166 | 128 | 162 |
| 1928 | 100 | 81 | 202 | 188 | 146 | 170 |
| 1929 | 96 | 72 | 161 | 142 | 137 | 162 |
| 1930 | 92 | 64 | 137 | 141 | 112 | 130 |
| 1931 | 88 | 51 | 89 | 112 | 63 | 70 |
| 1932 | 71 | 36 | 62 | 62 | 36 | 39 |
| 1933 | 59 | 39 | 84 | 81 | 97 | 71 |
| 1934 | 59 | 42 | 127 | 89 | 79 | 93 |
| 1935 | 57 | 40 | 131 | 88 | 91 | 104 |
| 1936 | 59 | 43 | 119 | 97 | 106 | 131 |
| 1937 | 61 | 46 | 140 | 132 | 120 | 122 |
| 1938 | 63 | 48 | 105 | 106 | 93 | 100 |
| 1939 | 63 | 47 | 115 | 125 | 115 | 111 |
| 1940 | 63 | 48 | 133 | 124 | 99 | 96 |
| 1941 | 63 | 49 | 157 | 151 | 112 | 126 |
| 1942 | 65 | 49 | 175 | 163 | 150 | 192 |
| 1943 | 65 | 50 | 180 | 163 | 144 | 189 |
| 1944 | 65 | 50 | 219 | 163 | 144 | 191 |
| 1945 | 65 | 50 | 223 | 163 | 144 | 191 |
| 1946 | 74 | 51 | 315 | 209 | 196 | 265 |
| 1947 | 93 | 56 | 363 | 302 | 374 | 297 |
| 1948 | 107 | 71 | 370 | 300 | 322 | 280 |
| 1949 | 117 | 80 | 289 | 373 | 318 | 302 |
| October | 115 | 81 | 284 | 413 | 335 | 331 |
| November | 112 | 81 | 297 | 403 | 308 | 306 |
| December | 112 | 81 | 311 | 393 | 293 | 282 |
| 1950 | | | | | | |
| January | 112 | 81 | 293 | 391 | 304 | 286 |
| February | 112 | 81 | 268 | 381 | 266 | 255 |
| March | 112 | 81 | 277 | 369 | 302 | 265 |
| April | 112 | 81 | 295 | 356 | 308 | 233 |
| May | 112 | 72 | 307 | 339 | 301 | 216 |
| June | 112 | 60 | 301 | 306 | 279 | 209 |
| July | 112 | 60 | 329 | 303 | 277 | 248 |
| August | 112 | 60 | 327 | 313 | 315 | 280 |
| September | 112 | 60 | 327 | 307 | 322 | 293 |

## Wholesale Prices of Phosphates and Potash * *

| | Superphosphate, Baltimore, per unit | Florida land pebble, 68% f.o.b. mines, bulk, per ton | Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton | Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2] | Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2] | Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2] | Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2] |
|---|---|---|---|---|---|---|---|
| 1910–14 | $0.536 | $3.61 | $4.88 | $0.714 | $0.953 | $24.18 | $0.657 |
| 1925 | .600 | 2.44 | 6.16 | .584 | .860 | 23.72 | .483 |
| 1926 | .598 | 3.20 | 5.57 | .596 | .854 | 23.58 | .537 |
| 1927 | .525 | 3.09 | 5.50 | .646 | .924 | 25.55 | .586 |
| 1928 | .580 | 3.12 | 5.50 | .669 | .957 | 26.46 | .607 |
| 1929 | .609 | 3.18 | 5.50 | .672 | .962 | 26.59 | .610 |
| 1930 | .542 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 |
| 1931 | .485 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 |
| 1932 | .458 | 3.18 | 5.50 | .681 | .963 | 26.90 | .618 |
| 1933 | .434 | 3.11 | 5.50 | .662 | .864 | 25.10 | .601 |
| 1934 | .487 | 3.14 | 5.67 | .486 | .751 | 22.49 | .483 |
| 1935 | .492 | 3.30 | 5.69 | .415 | .684 | 21.44 | .444 |
| 1936 | .476 | 1.85 | 5.50 | .464 | .708 | 22.94 | .505 |
| 1937 | .510 | 1.85 | 5.50 | .508 | .757 | 24.70 | .556 |
| 1938 | .492 | 1.85 | 5.50 | .523 | .774 | 15.17 | .572 |
| 1939 | .478 | 1.90 | 5.50 | .521 | .751 | 24.52 | .570 |
| 1940 | .516 | 1.90 | 5.50 | .517 | .730 | 24.75 | .573 |
| 1941 | .547 | 1.94 | 5.64 | .522 | .780 | 25.55 | .367 |
| 1942 | .600 | 2.13 | 6.29 | .522 | .810 | 25.74 | .205 |
| 1943 | .631 | 2.00 | 5.93 | .522 | .786 | 25.35 | .195 |
| 1944 | .645 | 2.10 | 6.10 | .522 | .777 | 25.35 | .195 |
| 1945 | .650 | 2.20 | 6.23 | .522 | .777 | 25.35 | .195 |
| 1946 | .671 | 2.41 | 6.50 | .508 | .769 | 24.70 | .190 |
| 1947 | .746 | 3.05 | 6.60 | .432 | .706 | 18.93 | .195 |
| 1948 | .764 | 4.27 | 6.60 | .397 | .681 | 14.14 | .195 |
| 1949 | .770 | 3.88 | 6.22 | .397 | .703 | 14.14 | .195 |
| October | .770 | 3.75 | 5.47 | .375 | .720 | 14.50 | .200 |
| November | .770 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| December | .770 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| 1950 | | | | | | | |
| January | .762 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| February | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| March | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| April | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| May | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| June | .760 | 3.76 | 5.47 | .336 | .647 | 12.77 | .176 |
| July | .760 | 3.76 | 5.47 | .368 | .704 | 13.98 | .193 |
| August | .760 | 3.76 | 5.47 | .368 | .704 | 13.98 | .193 |
| September | .760 | 3.75 | 5.47 | .368 | .704 | 13.98 | .193 |
| **Index Numbers (1910-14 = 100)** | | | | | | | |
| 1925 | 110 | 68 | 126 | 82 | 90 | 98 | 74 |
| 1926 | 112 | 88 | 114 | 83 | 90 | 98 | 82 |
| 1927 | 100 | 86 | 113 | 90 | 97 | 106 | 89 |
| 1928 | 108 | 86 | 113 | 94 | 100 | 109 | 92 |
| 1929 | 114 | 88 | 113 | 94 | 101 | 110 | 93 |
| 1930 | 101 | 88 | 113 | 95 | 102 | 111 | 94 |
| 1931 | 90 | 88 | 113 | 95 | 102 | 111 | 94 |
| 1932 | 85 | 88 | 113 | 95 | 101 | 111 | 94 |
| 1933 | 81 | 86 | 113 | 93 | 91 | 104 | 91 |
| 1934 | 91 | 87 | 110 | 68 | 79 | 93 | 74 |
| 1935 | 92 | 91 | 117 | 58 | 72 | 89 | 68 |
| 1936 | 89 | 51 | 113 | 65 | 74 | 95 | 77 |
| 1937 | 95 | 51 | 113 | 71 | 79 | 102 | 85 |
| 1938 | 92 | 51 | 113 | 73 | 81 | 104 | 87 |
| 1939 | 89 | 53 | 113 | 73 | 79 | 101 | 87 |
| 1940 | 96 | 53 | 113 | 72 | 77 | 102 | 87 |
| 1941 | 102 | 54 | 110 | 73 | 82 | 106 | 87 |
| 1942 | 112 | 59 | 129 | 73 | 85 | 106 | 84 |
| 1943 | 117 | 55 | 121 | 73 | 82 | 105 | 83 |
| 1944 | 120 | 58 | 125 | 73 | 82 | 105 | 83 |
| 1945 | 121 | 61 | 128 | 73 | 82 | 105 | 83 |
| 1946 | 125 | 67 | 133 | 71 | 81 | 102 | 82 |
| 1947 | 139 | 84 | 135 | 70 | 74 | 78 | 83 |
| 1948 | 143 | 118 | 135 | 67 | 72 | 58 | 83 |
| 1949 | 144 | 108 | 128 | 67 | 74 | 58 | 83 |
| October | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| November | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| December | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| 1950 | | | | | | | |
| January | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| February | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| March | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| April | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| May | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| June | 142 | 104 | 112 | 63 | 68 | 53 | 80 |
| July | 142 | 104 | 112 | 67 | 74 | 58 | 82 |
| August | 142 | 104 | 112 | 67 | 74 | 58 | 82 |
| September | 142 | 104 | 112 | 67 | 74 | 58 | 82 |

## Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

| | Farm prices* | Prices paid by farmers for commodities bought* | Wholesale prices of all commodities† | Fertilizer material‡ | Chemical ammoniates | Organic ammoniates | Superphosphate | Potash** |
|---|---|---|---|---|---|---|---|---|
| 1925..... | 156 | 153 | 151 | 112 | 100 | 131 | 109 | 80 |
| 1926..... | 146 | 150 | 146 | 119 | 94 | 135 | 112 | 86 |
| 1927..... | 141 | 148 | 139 | 116 | 89 | 150 | 100 | 94 |
| 1928..... | 149 | 152 | 141 | 121 | 87 | 177 | 108 | 97 |
| 1929..... | 148 | 150 | 139 | 114 | 79 | 146 | 114 | 97 |
| 1930..... | 125 | 140 | 126 | 105 | 72 | 131 | 101 | 99 |
| 1931..... | 87 | 119 | 107 | 83 | 62 | 83 | 90 | 99 |
| 1932..... | 65 | 102 | 95 | 71 | 46 | 48 | 85 | 99 |
| 1933..... | 70 | 104 | 96 | 70 | 45 | 71 | 81 | 95 |
| 1934..... | 90 | 118 | 109 | 72 | 47 | 90 | 91 | 72 |
| 1935..... | 109 | 123 | 117 | 70 | 45 | 97 | 92 | 63 |
| 1936..... | 114 | 123 | 118 | 73 | 47 | 107 | 89 | 69 |
| 1937..... | 122 | 130 | 126 | 81 | 50 | 129 | 95 | 75 |
| 1938..... | 97 | 122 | 115 | 78 | 52 | 101 | 92 | 77 |
| 1939..... | 95 | 121 | 112 | 79 | 51 | 119 | 89 | 77 |
| 1940..... | 100 | 122 | 115 | 80 | 52 | 114 | 96 | 77 |
| 1941..... | 123 | 130 | 127 | 86 | 56 | 130 | 102 | 77 |
| 1942..... | 158 | 149 | 144 | 93 | 57 | 161 | 112 | 77 |
| 1943..... | 192 | 165 | 151 | 94 | 57 | 160 | 117 | 77 |
| 1944..... | 196 | 174 | 152 | 96 | 57 | 174 | 120 | 76 |
| 1945..... | 206 | 180 | 154 | 97 | 57 | 175 | 121 | 76 |
| 1946..... | 234 | 197 | 177 | 107 | 62 | 240 | 125 | 75 |
| 1947..... | 275 | 231 | 222 | 130 | 74 | 362 | 139 | 72 |
| 1948..... | 285 | 250 | 241 | 134 | 89 | 314 | 143 | 70 |
| 1949 | | | | | | | | |
| October... | 242 | 237 | 222 | 138 | 98 | 331 | 144 | 72 |
| November. | 237 | 236 | 221 | 136 | 96 | 321 | 144 | 72 |
| December.. | 233 | 237 | 221 | 136 | 96 | 317 | 144 | 72 |
| 1950 | | | | | | | | |
| January... | 235 | 238 | 221 | 135 | 96 | 316 | 142 | 72 |
| February.. | 237 | 237 | 223 | 132 | 96 | 286 | 142 | 72 |
| March.... | 237 | 239 | 223 | 134 | 96 | 305 | 142 | 72 |
| April..... | 241 | 240 | 223 | 135 | 96 | 313 | 142 | 72 |
| May..... | 247 | 244 | 228 | 132 | 91 | 311 | 142 | 72 |
| June..... | 247 | 245 | 230 | 126 | 85 | 293 | 142 | 66 |
| July..... | 263 | 247 | 238 | 128 | 85 | 301 | 142 | 70 |
| August.... | 267 | 248 | 243 | 131 | 85 | 321 | 142 | 70 |
| September. | 272 | 250 | 247 | 131 | 85 | 324 | 142 | 70 |

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

**[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.**

**[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.**

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit $K_2O$ thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

# REVIEWS

**This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.**

## Fertilizers

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# Some Recent Books

THE PRODUCTION OF TOBACCO, by W. W. Garner (Blakiston Company, Philadelphia, Pa., 1946. $4.50). This is the most complete book available on the subject of tobacco growing and handling. The author has spent nearly 40 years conducting and directing investigations on tobacco in the United States. The book is divided into three main parts covering the industrial, production, and scientific aspects of tobacco. The origin of tobacco growing, the commercial classifications, the culture of the various types, domestic and foreign, harvesting, curing, marketing, and scientific investigations of physiological, chemical, biological, and genetic relationships are discussed. Practical agricultural, scientific, and commercial aspects of the tobacco industry are well covered.

VEGETABLE CROPS, by H. C. Thompson (McGraw-Hill Book Company, Inc., New York, 4th Edition, 1949. $6.00). The Fourth Edition of this well-known book on vegetable crops is similar to the previous editions. The subject matter, especially with reference to fertilizer recommendations, varieties, insecticides, and herbicides, has been brought up to date. New material on marketing and canning vegetables also has been added. This is one of the most complete books on vegetable crops and is an excellent reference as well as textbook.

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A young Augusta (Kansas) mother was discussing with an older woman the arrangement "worked out" with her husband about feeding the baby in the wee-small hours. "Who in your family got up to feed the baby at night?" she asked the elder.

"Well, she paused, "it certainly wasn't my husband. You see, young lady, we didn't have bottles then."

His health wasn't any too good, so the Eastern city-dweller went looking for a place to live in the Southwest. In one small town in Arizona, he approached an old-timer sitting on the steps of the general store. "Say," he asked, "what's the death rate around here?"

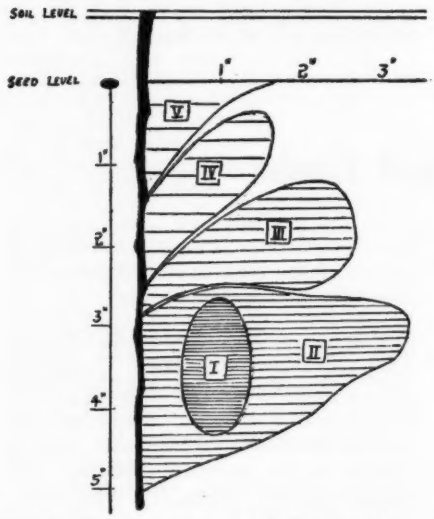
"Same as it is back East, bub," answered the old fellow, "one to a person."

# Band the Fertilizer for Best Results . . . .

(*From page* 20)

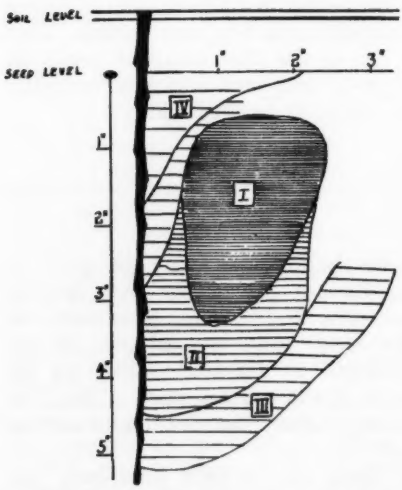
Such phosphate is shown as double circles ◎ in Figure 2.

Whatever the mechanism involved may be, phosphorus is not available in sufficient quantities in most western Washington soils for good growth of crops. Furthermore, only a little of the broadcast-applied phosphate fertilizer is utilized by crops. A great number of measurements comparing the relative response from broadcast and band-applied fertilizers have been made in many sections of western Washington. The fertilizers on the broadcast plots were worked into the soil with a spring-tooth harrow or a disc just previous to planting. The fertilizers in the band treatments were applied during the seeding operation. The information in Table I indicates the dollar value of band application over the broadcast application.




| AREA | YIELD PER ACRE TONS |
|---|---|
| I | 5 |
| II | 4½ - 5 |
| III | 4 - 4½ |
| IV | 3½ - 4 |
| V | 1½ - 2 |

Fig. 4. Effect of position of fertilizer band on yield of Idaho Refugee bush beans.




| AREA | YIELD PER ACRE TONS |
|---|---|
| I | 17 - 20 |
| II | 14 - 17 |
| III | 11 - 14 |
| IV | 5 - 11 |

Fig. 5. Effect of position of fertilizer band on yield of pickling cucumbers.

There are other benefits that may be derived from the band applications of fertilizers. Weed control for example has usually been easier in the plots in which the fertilizers were banded. When fertilizers were broadcast and disced into the soil, the weeds as well as the crop over the entire area were fertilized and stimulated. When the fertilizers were banded, the effect of the fertilizer was mostly on the crop planted, since

the area between the row received no fertilizer.

Band application of fertilizer has speeded up the maturity of sweet corn from 10 to 18 days when compared to plots in which the fertilizer was applied broadcast. This is an extremely important factor in western Washington where the season is short for sweet corn production. The same effect has been noted on certain other crops.

The position of the fertilizer band for best results varies with the crop, (Figures 4 and 5). In general it may be said that, under ideal moisture conditions, placement of the band from two to five inches directly under the seed is best for taprooted crops. Carrots, for instance, have responded best when the fertilizer was placed five inches deep directly under the seed. Unfortunately, injury may occur from placement directly under the seed in years or areas in which droughts occur during germination and early growth of the plants, (Figure 3). Because of the possibility of injury during unfavorable seasons, the band should be placed an inch or two to the side of the seed as well as below the level of the seed. Fibrous-rooted plants for the most part gave best results when the fertilizer was placed one or two inches to the side of the seed and an inch or two deeper than the seed. The recommended position of the fertilizer band or bands in respect to the seed or plants for western Washington conditions is listed in Table II.

Machinery for proper placement of fertilizer is available for some crops. Most potato planters which have fertilizer attachments may be adjusted so that the fertilizer may be placed in the desired positions. Certain planters commonly used for seeding beans in western Washington have satisfactory fertilizer distribution attachments. These bean planters may also be used for the planting of pole peas and cucumbers. In such cases the fertilizer openers are mounted on the cultivator bars of the tractor and so spaced to line up with the seeding equipment which is either mounted on the rear of the tractor or is pulled by it. When this cannot be done perhaps the next best bet is to apply the fertilizer as a sidedressing, as close to the plants as possible when the plants are large enough for the first cultivation.

TABLE II.—SUGGESTED POSITION OF FERTILIZER BAND OR BANDS

| Crop | Number of bands | Position of fertilizer band or bands in relation to seed or seedpiece |
|---|---|---|
| Sweet or field corn | 1 | 1″ to side, 1″ deeper than |
| Pole beans | 2 | 2″ to side, 2–3″ deeper than |
| Pole peas | 1 or 2 | 2″ to side, 2–3″ deeper than |
| Potatoes | 2 | 2″ to side, ½″ deeper than |
| Bush beans | 1 or 2 | 1–2″ to side, 2–4″ deeper than |
| Carrots | 1 | 1″ to side, 3–5″ deeper than |
| Broccoli | 1 or 2 | 2″ to side, 3″ below topsoil |
| Cabbage and seed cabbage | 1 or 2 | 2″ to side, 3″ below topsoil |
| Peas, freezing and canning | 1 | ½″ to side, 1″ deeper than seed (or predrill in bands before seeding) |
| Raspberries and blackberries | 2 | 12″ to side of, 3–4″ deep; distance from plants will be determined somewhat by root growth. |
| Spinach | 1 | ½–1″ to side, 2–3″ below soil |
| Red beets | 1 | ½–1″ to side, 2–3″ below soil |
| Red beets for seed | 1 | Directly below center of beet |
| Cucumbers for pickles | 2 | 2″ to side, 2″ below topsoil |

# Season-Long Pasture

A SEASON-LONG pasture program requires the use of high-yielding forage crops in New England, according to Herbert O. Allbritten, Extension Agronomist and the Rhode Island judge in the regional team for the Green Pastures contest last year. "I saw the top pastures of New England the last two weeks of August under severe drought conditions," he says. "In every case the men who had their soil in a high state of fertility had better pastures and hay crops than those using fertilizer on a limited scale."

The 18 leading farmers, three top men in each of the six New England states, used a total of 1,430 tons of lime, slightly more than a half ton for each acre of improved land, or more than a ton of lime per animal unit on these farms. No doubt, these men have been using lime as a part of their soil fertility program for many years. They bought 815 tons of fertilizer within the year, an average of 600 pounds of fertilizer per acre of land in feed crops, or a total of 1,250 pounds of fertilizer per animal unit on the farms.

To produce from three to five tons of dry forage or 12 to 20 tons of green weight as silage or pasture feed per acre, the soil must be well fertilized. With the New England leaders seeding more acres of ladino clover and alfalfa in grass mixtures, they are using fertilizer grades high in potash and phosphoric acid. Ladino and alfalfa need a medium to high level of fertility for the minerals—phosphorus, potassium, and calcium—for persistence of stand and high acre yields. Mr. Allbritten points out that potash is the fertilizer most likely to be deficient on ladino and alfalfa fields, and remarkable responses to liberal applications may be expected.

He reports that "several of the men bought potash and applied it direct or with manure and superphosphate. Others bought fertilizer with an 0-1-1 ratio, such as 0-14-14 or 0-20-20, for topdressing pastures and hay fields largely in clover and alfalfa." For ladino, 600 pounds of an 0-20-20 fertilizer or any fertilizer furnishing 120 pounds of $P_2O_5$ and $K_2O$ each per acre should be adequate for the year. When the forage becomes mostly grasses and the legumes thin out, a common fertilizer ratio used was a 1-2-2, such as a 5-10-10 or an 8-16-16 grade. Some went so far as to use a high-nitrogen fertilizer such as found in a 1-1-1 ratio.

All these men ranking high in pasture improvement work believe in the need for annual topdressing of pastures and hayfields. As to the best time of year, it doesn't matter too much whether the fertilizer is applied in the fall or spring, and the timing should depend largely on the seasonal labor and the draining pattern of the farm. Some of the fertilizer may be applied after the first cutting of hay or silage to stimulate a second growth. Where a heavy annual topdressing is practiced, two applications of the fertilizer would give better results than one application of all of it.

"Farmers and agronomists differ as to the wisdom of applying nitrogen fertilizers to legume grass mixtures," Mr. Allbritten says. "Some believe the persistence of ladino is threatened by the stimulated growth of the grasses and withhold the nitrogen until the ladino thins out for other reasons. But some had topdressed with manure or complete fertilizers without any apparent damage to the legumes in the stand. Perhaps the most common practice would be to omit nitrogen for the first two years while ladino predominates the total forage growth. It is suggested, though, that all legumes should have the seed inoculated before seeding to insure good nodule formation and the promotion of nitrogen fixation from the air."

Irrigation of pastures brings additional fertilizer problems. With highest moisture conditions, pastures and hay land will need several light applications of fertilizer per year. Irrigation should and will increase the acre rates of fertilizer needed for pasture land, Mr. Allbritten believes. . . *H. M. Hofford, Extension Editor, Rhode Island State College, Kingston, R. I.*

# Tung Trees Triple Oil Yield Through Research

Five hundred thousand improved tung trees in the Gulf Coast region provide a clear-cut example of the value of varied research in increasing the efficiency of a crop. From a few seeds brought from China less than 50 years ago, the industry has increased until the growers actually turn out $5,000,000 worth of nuts containing more than 50 per cent high-grade drying oil. This is small compared with the value and production of major crops. But according to Dr. Felix Lagasse, Tung Specialist of the U. S. Department of Agriculture, and cooperators at the Florida Experiment Station, the domestic crop sometimes assumes high importance and in the future will no doubt fill more of the industry's needs. During World War II, he says, tung oil, because of very special uses, "was considered a strategic material."

The half million improved trees are the result of the growers' readiness to set out trees of seedling progenies which the research men have found and tested. These trees yield three times as much oil as the early untested seedling trees. But, according to Lagasse, research has brought in other improved factors besides those of selections.

For example, it is now possible to tell what kind of soils are best suited to tung trees. Mineral deficiencies—such as copper, manganese, or potash—have been plainly revealed by certain patterns in the leaves and by careful leaf analysis.

They have learned the fertilizer needs of trees of different stages and what time of year to put it on; what cover crops cut production costs; a sure-fire way to germinate the seed; found what pre-emergence 2,4-D spraying is a practical method of weed control; a more accurate and cheaper method of oil analysis to check up on new varieties and methods; and engineers have devised better tung nut drying equipment. But there is more payoff from research than from the tung industry itself. Lagasse says that results from soil, nutrition and cultural studies with tung nuts are apt to prove useful on any number of other crops. Already the new oil determination method is being tried on peanuts and orange and grapefruit seed meals. And it is possible that corn and crotalaria will benefit from the same mineral treatment.

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"You know, politicians don't have it so easy."

"Why not?"

"You try straddling a fence and keeping both ears to the ground."

* * *

Football season: The time of year when you can walk down the street with a blonde on one arm and a blanket on the other and no cop gives you a funny look.

An exchange tells of overhearing a woman shopping for a pair of pants for her little boy in a large department store recently.

"Do you want knickers with a zipper?" asked the clerk.

"No," she replied, "Johnnie has a sweater with a zipper and he's always getting his tie caught in it."

## Know Your Soil

(*From page* 23)

the problems connected with the soil. It is not known whether or not a sod rotation in the Collington sandy loam would have resulted in a build-up in organic matter content similar to the Conestoga silt loam, but the continuous cash crop rotation did not result in a great improvement.

TABLE III.—SOIL TEST FOR COLLINGTON SANDY LOAM.

| | | pH | Pounds per acre | | | | | | | % Organic matter | Ohms Resistance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CaO | MgO | Al | N as $NO_3$ | $P_2O_5$ | $K_2O$ | Mn | | Salt concentration |
| Experiment | Top soil | 6.2 | 192 | 126 | 1.1 | 11 | 60+ | 166 | 0.8 | 1.2 | 2,150 |
| | Sub soil | 5.3 | 230 | 186 | 3.8 | 26 | 14 | 91 | 0.9 | 0.6 | 850 |
| Farm Acre | Top soil | 5.5 | 86 | 270+ | 3.1 | 8 | 18 | 86 | 1.0 | 1.2 | 2,900 |
| | Sub soil | 5.5 | 125 | 270+ | 6.7 | 9 | 24 | 16 | 1.0 | 0.6 | 1,600 |

Hester extraction method.

## Royce Mitchell Succeeds . . . .

(*From page* 26)

could look at that pasture and tell to the exact line where I put the potash."

With a grin, I asked Mitchell if he always had fertilized grass and clover as liberally as he does now.

"I used to put it out this way," he said, swinging his arm and rubbing his fingers like he was sprinkling a little fertilizer. "But we haven't lost any money on seed and fertilizer so far," he added.

The "we" includes Mr. and Mrs. Mitchell's 14-year-old son, William. A 4-H Club member, William has won first place in the Walthall County fat calf show for club boys every year beginning in 1945. And the calf he showed in the county in 1944 placed first in the district show at Hattiesburg, ahead of the Walthall winner. Assistant County Agent N. J. Taylor helps William with his calf club work.

William put in savings bonds his 1944 winnings—$800, a dollar a pound for his district champion. He has turned other winnings into savings bonds. His goal—a degree in animal husbandry from Mississippi State College.

"I hope he'll get some courses in business administration and soils, too," the father said. "Of course, I'd like to have William come back and be a partner with me in beef cattle farming, but I'm leaving that up to him."

You can see many other benefits of grassland-soil conservation farming on the Mitchell place. Since I first went to this farm, Mitchell has built a modern home, a large barn, and a tool shed.

Last June, I saw an almost-new tractor and mower clipping weeds in the pastures. A truck was being used to haul manure to a few galled spots on a hillside. Under the tool shed were a combine, a fertilizer distributor-seeder, and other modern equipment.

### Pasture Summary

After walking over the pastures we cooled in the shade of a pecan tree near the house and began to summarize the pasture acreages this year:

30 acres of Dallis grass-white clover.

20 acres of Kentucky 31 fescue planted last fall and grazed only three weeks because Mitchell's cattle have plenty to eat elsewhere.

15 acres of white clover growing in a stand pure enough to harvest seed. The cattle spread the clover seed to this land while grazing small grain or Alyce clover.

10 acres of white clover planted in 1945.

15 acres of sericea, overseeded with crimson clover for winter grazing.

12 acres of young kudzu, yet to come into grazing.

23 acres of oats for grazing. This land has such a good volunteer stand of white clover that it could be classed as white clover pasture.

30 acres of oats for grazing and for grain. In June, Alyce clover following the oats was just coming up. All the oat stubble had been returned to the soil, and it was filled with organic matter. The Alyce clover can be used for grazing, for seed, or for hay, depending on the needs of his cattle.

### Row Crops

With this summary before me, I thought of two questions.

The first was, "What about row crops?"

"Five acres of corn," he said. "We need some corn for feed around the farm, and for meal. The rest of my land is in protected woods including six acres of planted pines, in two farm ponds, and in the house and barn sites."

Later we saw the corn patch — hybrid and open-pollinated corn that looked like it should be in the Midwest, not in the deep South.

The second question was, "How about the oat yields?"

"We got between 1,000 and 1,100 bushels from 20 acres of Victor grain oats," he replied. "That's more than 50 bushels an acre. I think the clover crops and fertilization are the secret of the good yields we made."

### Seed Crops

Seed crops are more than a by-product on this livestock farm, yet, as the owner explained, "We never save a crop of seed if we're short of grazing." Ten acres of white clover, across the road east of the house and above the big farm pond, averaged more than 100 pounds of clean seed to the acre this year. This same land has yielded as many as 400 pounds of Alyce clover seed to the acre. This year's seed crops of crimson clover and fescue were light. It was Mitchell's first experience with them. He said he believed he might have saved more than 50 pounds of fescue seed to the acre if his cattle had grazed it longer.

When I saw the fescue, it was soon after he had combined seed. It was the densest, rankest, first-year fescue I've seen. There was reason: Seeding on a well-prepared seedbed, a ton of calcium silicate slag, 100 pounds of muriate of potash, 600 pounds of 20 per cent phosphate, and 200 pounds of ammonium nitrate at seeding time in October 1949 plus 200 more pounds of ammonium nitrate this spring. Some of the fescue seed will be planted in the brush-covered hollows—the only idle land now on the farm. Mitchell said he believes the fescue sod will hold up his cattle on the wet-natured land.

The farm now is carrying 87 grown and young cattle, with a surplus of grazing at most seasons of the year. Mitchell has 40 brood cows, hopes to have 60 eventually. He sells grass-and-milk-fat calves when they weigh between 500 and 600 pounds.

Two registered Hereford bulls are on the farm. The old herd sire is of Domino breeding. The young bull, yet to be placed with the herd, is of the Baldwin line. County Agent Ansel Estess helped Mitchell select the young bull. The herd now includes 11 registered cows, 5 registered heifers, and 5 young bulls selected to be sold as registered animals.

Looking back to the time when the Soil Conservation Service helped him make a complete-farm soil and water conservation plan, Mitchell told me:

"I never did any real farming until I got a farm plan."

## Indiana Muck Crop Champions

(*From page* 24)

Mr. Emme planted 33 bushels of certified Prince Edward Island Katahdin seed potatoes to the acre with a planter which put the fertilizer in two bands on each side of the seed pieces. He used 1,000 pounds of 0-9-27 fertilizer in which 100 pounds of sulphur had been mixed. He thinks sulphur helps prevent potato scab.

The potatoes were planted on May 11, two to four inches deep in 36-inch rows, and the seed pieces were placed 10 inches apart in the rows. The crop was sprayed seven times with Diathane and DDT using 100 to 150 gallons per acre at each application.

### Champion Onion Grower

In 1949, Indiana had the poorest onion crop in the last 17 years. Most growers had less than half a crop.

The winner was Fred Fraser of Rochester, with a yield of 591 bushels to the acre. He planted Southport Yellow Globe seed on April 30 in 12-inch rows, using 5½ pounds of seed per acre. A green manure rye crop 18 inches high was turned under and the field was fertilized with 1,000 pounds of 0-9-27 fertilizer per acre.

Mr. Fraser was also named State Muck Crop Champion because the yields of his three muck crops were higher than those of the other contestants. His potatoes yielded 401 bushels to the acre and the cabbage 15 tons to the acre.

He planted certified Prince Edward Island Sebago seed potatoes on May 27, using 25 bushels of seed to the acre. One thousand forty (1,040) pounds of 0-9-27 fertilizer per acre were used, and he dusted five times using COCS and DDT dust.

The Racine Market cabbage was direct seeded May 5 and 6 in 28-inch rows. The plants were thinned to 20 inches apart in the rows. He used 1,000 pounds of 0-9-27 fertilizer to the acre, and the cabbage was dusted twice with five per cent DDT dust.

## Keep Crop Residues . . . .

(*From page* 16)

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## Fall Maneuvers

(*From page* 5)

IN every little crossroads school you find this same American dream bearing fruit, and rural churches and farm cooperatives uphold the dignity of man and the principles of fair play. The sad thing is that we cannot really "beam" this true situation by radio to those who never saw it or who have never known what America is like. Like religion, those who need it most never get it. Fanatic deception is no substitute for what we enjoy—and I must admit, often fail to fully appreciate until somebody threatens to rob us of it.

How simply but plainly General Ike Eisenhower said it when he stated: "We instinctively trust nations in which the power resides in the hands of the people, because we believe that the people do not want wars. For that reason we are against dictatorships."

In the midst of the world fever there are also internal efforts we must make to accomplish things that armed force alone can't easily do. Most of these efforts the humblest of us can work for without using up the scarce materials or running up against priorities.

We elder observers can refrain from whining about "them good old days" and stop preaching moss-grown doctrines to modern ears. Nostalgia is great stuff, like history, but we don't rely on flintlocks, corduroy roads, the pony express, and beacon signal fires any longer. Time marches on!

Education should not be neglected. Reports show how overcrowded many of our schools have become and what a burden is placed upon those who administer facilities and do the classroom work. Getting a sound education of mixed practical and classical subjects remains a leading need. Our youth must step into the breach left by young members of the armed forces—some of them never to return.

Local communities must organize and find good leadership in first aid and nursing technique, because modern warfare has a nasty habit of landing on the innocent bystanders.

Country groups are going to set up relief centers and provide the hospitality in cases where urban communities suffer possible air attack which drives refugees out into the open roads seeking shelter and food.

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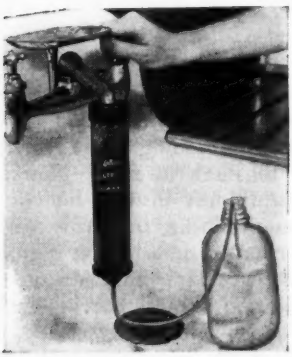

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Take good care of our health meanwhile. Epidemics and bacterial diseases are a bad setback at any time, but more so in times of war, or "half-war" defense periods.

Many mothers and fathers will be away from homes in some kind of defense effort. What are we going to do about the children? Will they be left to wander into woe and wickedness?

Restore those welcome rest places for service people and give of your talent and strength to cheer the kids so far from home.

See that all the overseas recruits and those in training here receive messages when the sergeant passes out the mail. I met a soldier in Stuttgart last fall who lived in my town. Upon asking him if I might take a message to his mother, he replied that he was an orphan and never heard from home.

Continue to encourage research. Unlike some kinds of business and petty politics, it is indispensable. Farm and food research can be as essential as the elements of direct defense. A letdown here might prove costly in a pinch.

Farm folks never like to see war in this country or in any other. The hardest part we have to play and the worst contradiction we must swallow are to stand for bombing and killing and demolishing foreign countrysides as a necessary move to victory. We fall back upon the only solace we have, that such cruelty is done for defense or to guarantee freedom elsewhere, which is always bought at a terrible price. That we know such behavior is not of our own choosing but is forced upon us because we are now the world's best hope for security and liberty does not always make it easy to take along with our spiritual beliefs.

This gradual achievement of the No. 1 spot in a damaged world has been rather hard to realize. Many of my old chums out in the Midlands and beyond have remained champions of isolationism through two world struggles, although the majority now have changed their minds on that issue.

Many of us came naturally by that instinct. America was a haven for the oppressed and grew strong by its own initiative and invention to such a great degree that we grew up convinced that entangling alliances with foreigners were a delusion and a snare. We finally broke through and did it in World War I, but I recall how vehement some farm fathers were in 1939-40 against going back there again to "settle Europe's mess."

As I walk the streets of those old comfortable towns again, many of the landmarks remain unchanged, mementoes of a time when our country was very young and unsophisticated, bent solely upon its own progress—if any—and deaf to the clamors and crowns and dynasties abroad. But the leaders of the same towns are men with experience in two world struggles, officers of veteran lodges, tough and practical fellows like the Paul Reveres and Sam Adamses and Thomas Paines of yore. In a couple of months or less, proof of their prowess will be seen in a revitalized National Guard and willing and trained Reservists.

Some of them may be a little extreme and excitable in their zeal and make speeches that give Old Man Malik a cue for hollering "war-mongers." But you can trust them in a pinch to come through with flying colors and a straight bead on the target. The old-timers also were excitable extremists sometimes, like Ethan Allen at Ticonderoga and Admiral Perry at Lake Erie.

From all I can learn here and there from old pals in the hinterlands, America is going to do at last what Teddy Roosevelt urged back in my youth: "Speak softly, but carry a Big Stick!" From what they tell me out yonder where the manpower grows there isn't going to be any more whittling down that big stick for spearing cocktail olives with either. If there's going to be a party, it won't be a soft parlor game if and when the bully-boys invite themselves over.

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"There," said the medical examiner, unrolling the eye chart, "read the fourth line down from the top."

"Read it?" chortled the patient. "Why, I know the guy personally. He used to play football at my school."

* * *

Old Lady: "Are you a little boy or a little girl?"

Young Child: "What else could I be?"

* * *

Joe: "I'm going to bring my girl a corsage tonight."

Bill: "I suppose you know your girl well enough to do that but I'm just going to bring mine flowers."

* * *

And then there was the sailor who treated all his girls with wine. He wanted a little port in every sweetheart.

* * *

He: "Shall we go to the movies?"

She: "We don't have to; the folks are going."

* * *

The plain, prim little old lady who stood beside a male customer at a department store counter was nervous and embarrassed; finally she said:

"Please Miss, I'd like two packages of bath room stationery."

1st Grade Boy—"How did you like that movie?"

2nd Grade Boy—"It was okey. I shut my eyes during the kissing scene and made believe he's choking her."

* * *

Political Orator—"All that I am or ever will be, I owe to my mother."

Heckler—"Why don't you send her 30 cents and square the account?"

* * *

Sambo—"Boy, what does you-all think 'bout dis heah sex busines dey's argufyin' 'bout?"

Mose—"Son, Ah thinks a man has got a puffick right to belong to any sex he wish."

* * *

A salesman who obviously didn't know little boys very well rapped on the screen door at a house where, just inside and plainly visible, was an eight-year-old painfully practicing his music lesson on the piano.

"Sonny," he inquired pleasantly, "is your mother home?"

The boy gave the salesman a murderous look over his shoulder, then growled, "What do you think, mister?"

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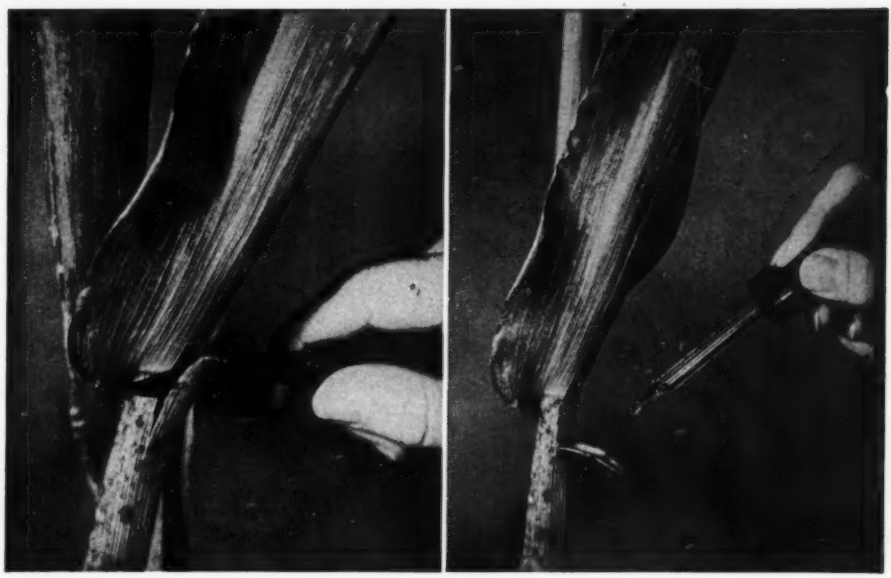

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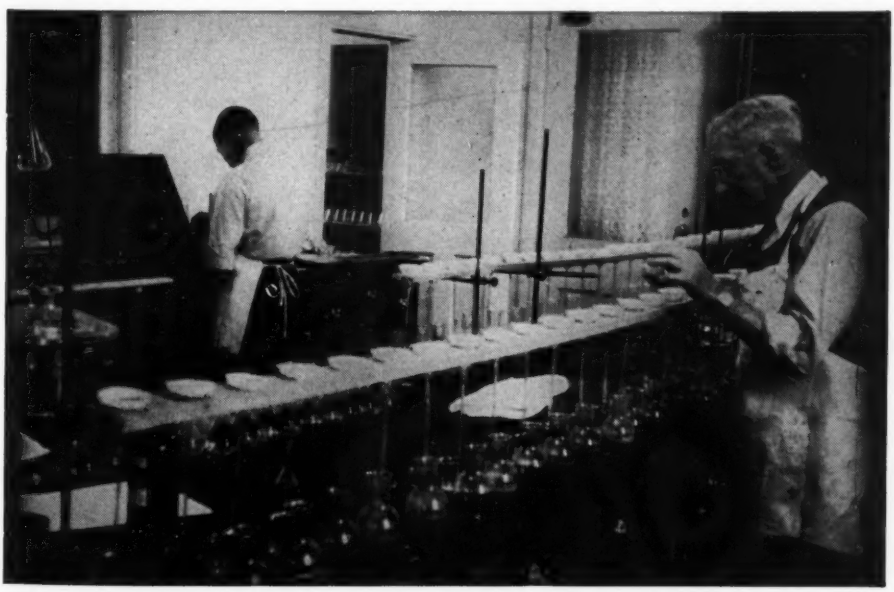

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